

## A Systematic Study of the Genus *Nymphicula* SNELLEN from Japan (Lepidoptera: Pyralidae)\*

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**Synopsis** Japanese species of the genus *Nymphicula* are revised. Three new species, *N. saigusai*, *albibasalis* and *minuta* are described and a newly recorded species, *junctalis* (HAMPSON) is redescribed. *N. saigusai* has hitherto been known as *blandialis* WALKER in Japan. The immature stages of *N. saigusai* and *junctalis* are also described. The taxonomic status of *Nymphicula* is discussed.

### Introduction

The genus *Nymphicula* of the subfamily Nymphulinae was first erected by SNELLEN (1880a) based on a single species, *stipalis* SNELLEN from Sumatra, Java and Sulawesi. He (1880b) also described two species of this genus from Sulawesi. KLIMA (1937) treated *stipalis* as a synonym of *Cataclysta blandialis* WALKER, 1859. Since then the genus *Nymphicula* has been treated as a synonym of *Cataclysta*. The genus *Cataclysta* was established by HÜBNER (1825) for the European *C. lemnata* (LINNAEUS). This genus is represented only by the type-species in Europe, but some ninety species were described mainly from the tropical regions of the world under the genus. One of the main diagnostic characters of *Cataclysta* is a series of some black spots on the outer margin of the hindwing. It has also the upturned labial palpus with the long and acute 3rd segment, the filiform maxillary palpus and the rounded frons. But the assemblage of species inadequately characterized as mentioned above seems probably heterogeneous.

In his generic revision of the Nearctic Nymphulinae, LANGE (1956) pointed out that there was no species congeneric with *Cataclysta lemnata* in North America. MUNROE (1972) treated *Nymphicula* as a valid genus closely related to the New World *Crysendeton* GROTE, 1881, which was treated as a synonym of *Cataclysta* by KLIMA (1937). In Japan, MUTUURA (1971) treated *blandialis* as a species belonging to the genus *Nymphicula*. However, both MUNROE and MUTUURA did not mention the reason of their treatment.

As a result of the comparison between the Nepalese *Nymphicula blandialis* and the European *Cataclysta lemnata*, I detected that the former species is remarkably different from the latter in the following characters. In *blandialis*, the vein Sc+R<sub>1</sub> of hindwing is completely anastomosed with Rs to the wing margin, while in *lemnata* these veins are bifurcated. The male genitalia of *blandialis* are slenderer and provided with much more elongate uncus and valvae, and the female genitalia are also slenderer and with pointed papillae anales. The larvae of *lemnata* live in the pond and their host plants

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are Lemnaceae. The immature stages of *blandialis* are unknown, but the larvae are inferred to be completely terrestrial and to feed on relatively primitive host plants, judging from the life histories of the close allies, *junctalis* and *saigusai* sp. nov.

Considering these data, I agree to treat *Nymphicula* as a genus distinct from *Cataclysta*. Thus the genus *Nymphicula* in my sense includes some other species described under the genus *Cataclysta*. According to my present knowledge, at least *C. junctalis* HAMPSON should be included in this genus, in addition to the following three new species from Japan.

This paper is the first step to revise the species described under the genus *Cataclysta* and to clarify the systematic position of *Nymphicula* in the Nymphulinae. In this study *N. junctalis* (nec *junctalis* MARUMO) is first recorded from Japan, and three new species, *N. saigusai*, *albibasalis* and *minuta* are described. The morphology and biological notes of immature stages of *junctalis* and *saigusai* are also given.

### Genus *Nymphicula* SNELLEN

*Nymphicula* SNELLEN, 1880, Midden Sumatra, 4(8): 78. Type-species: *Nymphicula stipalis* SNELLEN, 1880 (orig. des.) = *Cataclysta blandialis* WALKER, 1859.

*External characters* (♂ & ♀): Head with vertex prominent, bearing erect scales; frons rounded; chaetosemata present. Labial palpus slender, upturned, extending to vertex, basal 2 segments scaled roughly below and the 3rd acute at apex, longer than 1/2 of the 2nd. Maxillary palpus relatively long, extending forwards. Proboscis long. Antenna annulate; in ♂ short and thick, as long as about 1/2 of forewing length, each flagellar segment ventrally with many short sensory setae and a pair of long apical sensory setae; in ♀ filiform, as long as 3/4 of forewing length, flagellar segments with shorter ventral setae. Ocellus absent. Legs long; in ♂ 1st to 3rd tarsomeres of foreleg clothed laterally with thick scales except for *albibasalis*; in ♀ tarsus slender and simple.

Wings relatively narrow. In forewing vein  $R_{3+4}$  shortly stalked with  $R_5$  or  $R_2$ ; CuP and 2A reduced or absent. In hindwing vein  $Sc+R_1$  fused completely with  $R_s$  beyond discal cell, and  $R_s$  stalked with  $M_1$  at base. Ground color of upperside pale orange. Upperside of forewing: Costal margin fuscous in basal 1/2; antemedial band short, straight and white; trapezoidal smoky grey area occupying most of discal portion of wing, bordered basally with medial band, and distally with discocellular bar and obscure posterior portion of postmedial band; postmedial band white, wedge-shaped, distinct from costa to cell  $M_3$ , converging to outer margin of wing posteriorly, then retracted and forming distal border of trapezoidal area; submarginal band silvery grey except for anterior white portion, edged by fuscous sclaes, running parallel with outer margin of wing from costa to cell  $CuA_1$ , then retracted and represented by a silvery grey tornal marking. Cilia fuscous. Underside of forewing: Fuscous in proximal 2/3, with its distal portion bordered with marking comparable with trapezoidal area on upperside; the other portions almost same as above but slightly paler. Upperside of hindwing: Antemedial band white but often obscure; discal area broadly smoky grey; a white to orange discocellular lunule indistinctly dark-bordered; postmedial band dark brown, slender and undulate, inner margin with glittering marking at subternal area; marginal band modified into several black spots on tips of veins,

the spots partly glittered with metallic blue scales. Cilia fuscous to whitish, those on basal 1/3 darker. Underside of hindwing: Basal 2/3 whitish to fuscous; discocellular lunule present or absent; discal area same as above but somewhat paler; marginal black spots with metallic blue scales except in *albibasalis*.

*Male genitalia:* Externally slender in shape. Tegumen moderate in size, with anterior margin almost straight, anchylosed and fused with vinculum, leaving a longitudinal furrow between them; postero-lateral portions of tegumen forming a weak flange, and overlapping base of gnathos. Fenestrulae present and separated into two lateral parts by dorsal fusion of tegumen and uncus. Vinculum relatively long and narrowing ventrally, the lapel undeveloped. Saccus moderately developed, variable in shape. Uncus conspicuously long, evenly tapering to apex, usually with a few short setae laterally. Anal tube weakly sclerotized on ventral portion. Gnathos well developed, about 1/2 as long as uncus, projecting posteriorly into a long cochlear which bears some small denticles on dorsal surface. Valva much elongate, simple in structure; costa extending to near apex of valva; sacculus weakly developed, ending before middle of valva; inner surface of valva almost evenly sclerotized, bearing short setae. Phallus long and moderately slender, usually with many carinae on subzonal area; coecum penis well developed, often almost as long as rest of phallus; dorsal margin deeply emarginate.

In addition to these characters, a pair of hair tufts (hair pencil) are present on the lateral portions of intersegmental membrane between the 7th and 8th abdominal segments, and the 8th sternum has two pairs of specialized scale tufts on its antero-ventral surface.

*Female genitalia:* Apical abdominal segments slender, with pointed papillae anales. Ostium bursae small and membranous. Ductus bursae slender, membranous, and with a semicircular plate near ductus seminalis. Bursa copulatorix long and relatively narrow, about twice as long as 7th sternum; signum variable in shape, often represented by scobinate bands; cervix bursae undeveloped; ductus seminalis variable in thickness. Spermathecal gland without lagena. Eighth abdominal segment slender, with some setae at posterior portion; tergum reduced to U-shaped sclerite owing to a broad membrane expanded from posterior margin, apophysis anterioris about 1.5 times as long as 8th tergum; 8th sternum membranous, with some setae. Papillae anales considerably slender, tapering to pointed apex, and sparsely clothed with short setae; apophysis posterioris very long, about 1.5 times as long as apophysis anterioris.

*Remarks:* The genus *Nymphicula* differs from the genus *Cataclysta* in many characters as already mentioned in the introduction, and additional distinguishing characters of the genus are stated here in detail.

Body smaller in size and slenderer. Head also smaller in proportion to width of thorax, vertex more prominent, frons more rounded and narrower. Male antenna shorter and slenderer; maxillary palpus longer, with apex more acute; labial palpus as in *Cataclysta* in shape, but longer. Wings narrower, with apex more acute. Ground color of wings pale orange, while whitish to pale fuscous in *Cataclysta*; forewing with a broad smoky grey discal area. Base of vein  $M_3$  in forewing more apart from that of vein  $CuA_1$ . In male genitalia, tegumen wider, without a dorso-medial furrow seen

in *Cataclysta*, dorsum with a pair of small membranous fenestrulae near base of gnathos, but lacking a broad dorsal membranous area at base of uncus seen in *Cataclysta*; valva narrower and longer, without an incision at apex of costa; phallus longer, sometimes with cornutus; anellus without a pair of spines above juxta which is seen in *Cataclysta*. Female abdomen beyond 7th segment much more slender; ostium bursae smaller; ductus bursae longer, with semicircular plate near ductus seminalis; bursa copulatrix much longer, with distinct signa which is completely obsolete in *Cataclysta*; 8th tergum slenderer, broadly membranous on dorsal portion; papillae anales very slender, pointed at tip, without dense hairs on its ventral margin seen in *Cataclysta*, and apophyses much longer.

In view of these characters into consideration, the genus *Nymphicula* is not closely related to *Cataclysta* but rather related to Nearctic genus *Crysendeton*, as already pointed out by MUNROE (1972). The genus *Crysendeton* was established in 1881 by GROTE. Up to now this genus is represented by only three species occurring in the southeastern part of North America. It closely resembles *Nymphicula* in the wing pattern and coloration, hindwing venation, and the structure of the male and female genitalia. But there are some differences between them, that is, in *Crysendeton*, the ocelli are present and the hindtibia lacks outer preapical spur in the male.

The systematic position of *Nymphicula* and *Crysendeton* is problematical in the subfamily Nymphulinae. It is not easy to find the groups related to these genera, because the revisional study of this subfamily on the world basis is not sufficiently made yet. Among the characters common to these genera, vein Rs of the hindwing completely anastomosed with Sc+R<sub>1</sub>, much elongate uncus of the male genitalia and the elongate and narrow papillae anales of the female genitalia are specialized characters which are never found in the other genera of the tribes Nymphulini and Argyractini in LANGE's sense.

The immature stages of *Crysendeton* are unknown, whereas the larvae of *Nymphicula* are completely terrestrial and have the case-making habit. The case-making habit is evolved only in the Nymphulinae among Pyralidae. It is one of the outstanding behavioral character of this subfamily. I consider that this habit was developed as an adaptation for aquatic or semi-aquatic life. The cases of Nymphulini are rather rough in structure, made of small pieces of the host plants joined with a thread of silk. On the other hand, the case of *Nymphicula* is much elaborated, cylindrical, tightly made of fine soil particles and is provided with a movable cap on each end. The case-making habit of *Nymphicula*, therefore, seems to be much more specialized than that of Nymphulini. The other larval habits are known: the larvae of *Parargyractis* in Argyractini do not make case but spin thick web on the surface of rock in streams, and the larvae of *Eoophyla* and *Aulacodes*, resembling genera of Argyractini, have almost the same habit. Judging from these data, I consider that the larvae of *Nymphicula* changed their habitat from aquatic to terrestrial environment.

The genus *Nymphicula* is also unique in the larval morphology. The prothoracic shield is so well developed and so extensively expanded laterally that the L group of setae is included on this entire sclerite. This condition is unknown in any genus of Pyralidae so far as I am aware, and it is undoubtedly regarded as a specialized character of *Nymphicula*. The SV group of setae in the 1st and 2nd abdominal segments

is one and two in number, respectively (and also in Japanese *Eoophyla*), whereas two and three in the species of Nymphulini. Most of the pyralid genera have three SV setae on each of these segments or two and three, respectively. The reduction in the number of the setae in *Nymphicula* is also considered to be specialized condition.

There are two types of the wing marking in the subfamily Nymphulinae. In the first type which is characteristic of Nymphulini, the wing markings are represented by more or less distinct lines and bands which are very similar in both wings. In the forewing, the postmedial line or band runs almost parallel with the outer margin of the wing though it is retracted at vein CuA. This type is also seen in most species of Pyraustinae, and I consider it to be a primitive condition in Pyraustinae and Nymphulinae. The second type is seen in Argyractini and seems to be more advanced than in the first type. In the second type, the wing markings are different between the both wings. In the forewing the postmedial band is wedge-shaped, runs obliquely outwards from costa to vein CuA, strongly converges posteriorly to the outer margin of the wing and becomes very obscure beyond vein CuA. In the hindwing, the area distad of the postmedial band is modified to some black spots. In this respect *Nymphicula* and *Crysendeton* belong to the second type.

I compared both male and female genitalia of *Nymphicula* and *Crysendeton* with those of many other nymphuline genera, but was unable to find any genus close to these two.

Judging from all these characters, *Nymphicula* and *Crysendeton* are closely allied to each other, and a group consisting of these two genera may have a common ancestor with some of Argyractini. However, these two genera are so highly specialized that their systematic position cannot be shown clearly at present.

### Key to the Species of the Genus *Nymphicula* in Japan

1. Upperside of hindwing with proximal area to antemedial band tinged with fuscous; underside of hindwing with metallic blue scales on marginal spots; male foreleg widened laterally by thick scales on 1st to 3rd tarsomeres..... 2
- Upperside of hindwing with proximal area to antemedial band white; underside of hindwing without metallic blue scales on marginal spots; male foreleg without lateral thick scales on 1st to 3rd tarsomeres; forewing length 5.2–6.2 mm..... *albibasalis* sp. nov.
2. Upperside of forewing with tornal marking of submarginal band not curved; anastomotic portion of vein  $R_{3+4}$  with  $R_5$  shorter than  $1/4$  length of  $R_5$ ; hair pencil in male fulvous; saccus elliptical laterally, valva without long setae on inner surface..... 3
- Upperside of forewing with tornal marking of submarginal band curved strongly; vein  $R_{3+4}$  of forewing anastomosed with  $R_5$  for a long distance,  $1/4$  as long as length of  $R_5$ ; hair pencil in male blackish; saccus almost rectangular laterally, valva with long, posteriorly directed setae on inner surface; forewing length 4.9–5.6 mm..... *minuta* sp. nov.
3. Upperside of hindwing with 4 marginal spots; upperside of forewing with apex fuscous narrowly; male foreleg with lateral thick scales on tarsomeres partly

- blackish; tegumen long, with a distinct dorsal ridge longitudinally, phallus without cornutus; forewing length 6.3 mm.....*saigusai* sp. nov.
- Upperside of hindwing with 5 marginal spots; upperside of forewing with apex pale orange; male foreleg with lateral thick scales evenly fulvous; tegumen relatively short, without dorsal longitudinal ridge, phallus with cornutus; forewing length 6.9 mm.....*junctalis* (HAMPSON)

*Nymphicula saigusai* sp. nov.

*Cataclysta blandialis*: HAMPSON, 1897, Trans. ent. Soc. Lond., 1897: 197; SHIBUYA, 1929, Ins. matsum., 3: 128; MARUMO, 1942, Nozikairyo-siryô, 162: 17; INOUE, 1955, Check List Lep. Japan, 2: 157; MUTUURA, 1957, Icon. Het. Japon. Col. Nat., (1): 119.

*Nymphicula blandialis*: MUTUURA, 1971, Icon. Het. Japon. Col. Nat. (rev. ed.), 1: 119.

*External structure and coloration*: Head with vertex prominent, fulvous; scales between antennae long and erected. Frons evenly rounded and fulvous. Maxillary palpus directed upwards, relatively long and narrow; basal scales on proboscis fulvous and mixed with some fuscous ones. Labial palpus long and upturned, basal 2 segments fuscous on outer and dorsal surfaces, 3rd segment evenly fulvous and with acute tip. Antenna with scape fuscous on anterior surface and fulvous on posterior surface; dorsal scales of flagellum fulvous.

Thorax fulvous above, mixed with some fuscous scales, below fulvous to whitish. In male foreleg, coxa fuscous on anterior surface, femur fulvous but with fuscous suffusion on dorsal surface, tibia widened, fuscous on anterior surface, whitish on posterior surface, tarsus widened laterally by having fuscous scales on basal three tarsomeres. Female foreleg slender, tarsus without special scales laterally; anterior surface of coxa and dorsal surface of femur fuscous, the other portions whitish to fulvous, tarsus entirely fulvous. Midleg slender, femur fulvous except for pale fuscous dorsal surface and fuscous on anterior surface of distal end, tibia fulvous to whitish. Hindleg also slender, in male with a tuft of long fuscous scales from postero-distal portion of coxa, the other portions fulvous to whitish.

Abdomen slender, especially in male, fuscous above and whitish below.

*Upperside of forewing*: Ground color pale orange. Fuscous from base to antemedial band, in some specimens pale orange scales scattered in posterior portion. Antemedial band white, almost straight, running inwards, its costal area fuscous. Intermediate area between antemedial band and medial area pale orange, bordered with fuscous along both sides and tinged with fuscous near costa. Medial area trapezoidal in shape, appearing smoky grey owing to scattering of dark brown scales on white ground but darkened to fuscous and tinged with pale orange in front of discal cell. Anterior portion of postmedial band white, wedge-shaped, perpendicular to costa, straightly running from proximal 4/5 of costa to cell  $M_3$ . Both proximal and distal margins of the band faintly bordered with fuscous. Posterior portion of postmedial band forming distal margin of medial area behind discal cell and distinctly bordered distally with fuscous. Submarginal band narrow but dilated at costa, much tapering posteriorly and extending to cell  $CuA_1$ . The band white from costa to vein  $R_5$ , then changed to silvery grey beyond the vein, bordered with fuscous along proximal and distal margins. Tonal marking slender, bar-shaped, almost straight, running

outwardly from vein  $CuA_2$ , completely separated from smoky grey medial area and broadly touching tornus. Apex of wing narrowly fuscous. Cilia dark fuscous in proximal 2/5 of outer margin but uniformly paler in distal 3/5, rarely yellowish at pretornal area.

*Underside of forewing:* Proximal 3/4 evenly fuscous but cell C often yellowish with fine darker fuscous costa. The other portions same as upperside but generally a little paler.

*Upperside of hindwing:* Fuscous from base to antemedial band. Antemedial band white, extending outwards, narrowly bordered with fuscous distally. Intermediate area between antemedial band and medial area pale orange, with upper portion whitish and mixed with dark brown scales, tornal portion of intermediate area ending at tornal silvery area. Discocellular lunule white, bordered with dark brown scales. Medial area smoky grey as in forewing, bordered with fine white line arising from middle of costa, running parallel with wing margin, ending at tornal area. This white line characteristically bordered with blackish marginal line at middle 1/3 of costa, then touching costa without dark border and again bordered with narrow, undulate, fuscous submarginal line along outer margin. Marginal spots black, reduced to 4 in number by fusion of 2 spots in cells  $M_1$  and  $M_2$ , 1st and 4th spots larger than the others, rather clearly separated from each other and each spot pupilled with metallic blue scales. Marginal area between marginal spots pale orange, and wing apex cephalad of 1st marginal spot also pale orange. Cilia fuscous on proximal 1/3 of outer margin and whitish on distal 2/3, with some fuscous scales except for pale fuscous apex and tornus; cilia of posterior margin longer, whitish and accompanying with some pale orange scales from distal end of intermediate area.

*Underside of hindwing:* Almost same as upperside, but differing in the following points. Markings more indistinct. Basal region paler than upperside. Intermediate area between antemedial band and medial area also paler, appearing fulvous. Medial area fuscous without tornal metallic scales. First marginal spot with 2 pupils separated by vein  $M_1$ .

*Male genitalia:* Tegumen relatively narrow, longer than wide, anteriorly protruded and rounded in lateral view, with anterior margin very weakly emarginate in dorsal view, and with a distinct longitudinal dorsal ridge on anterior 1/2. Fenestrulae small, reduced to a pair of small membranous spots at lateral portions of uncal base. Vinculum narrow, gradually tapering towards saccus. Saccus long, elliptical in lateral view and depressed at both ends. Uncus aristate in shape, almost straight in lateral view, about 1.35 times as long as height of ring, and with sparse setae laterally and a pair of curved ridges at basal portion. Gnathos well developed, broadly articulated with uncus, produced into a long cochlear which tapers towards subapical portion, furnished dorsally with some small denticles at apical 1/2 and slightly swollen at dentate apex; apex of cochlear not reaching middle of uncus. Valva long, nearly parallel-sided, 5.1 times as long as wide, with dorsal margin weakly arched and dorso-distal portion much produced; inner surface of valva bearing moderately long setae which are not differentiated at apical portion. Phallus slender, nearly twice as long as height of ring and gently curved downwards beyond base of bulbus ejaculatorius; coecum penis rather short, about 0.28 as long as whole length of phallus; vesica without a

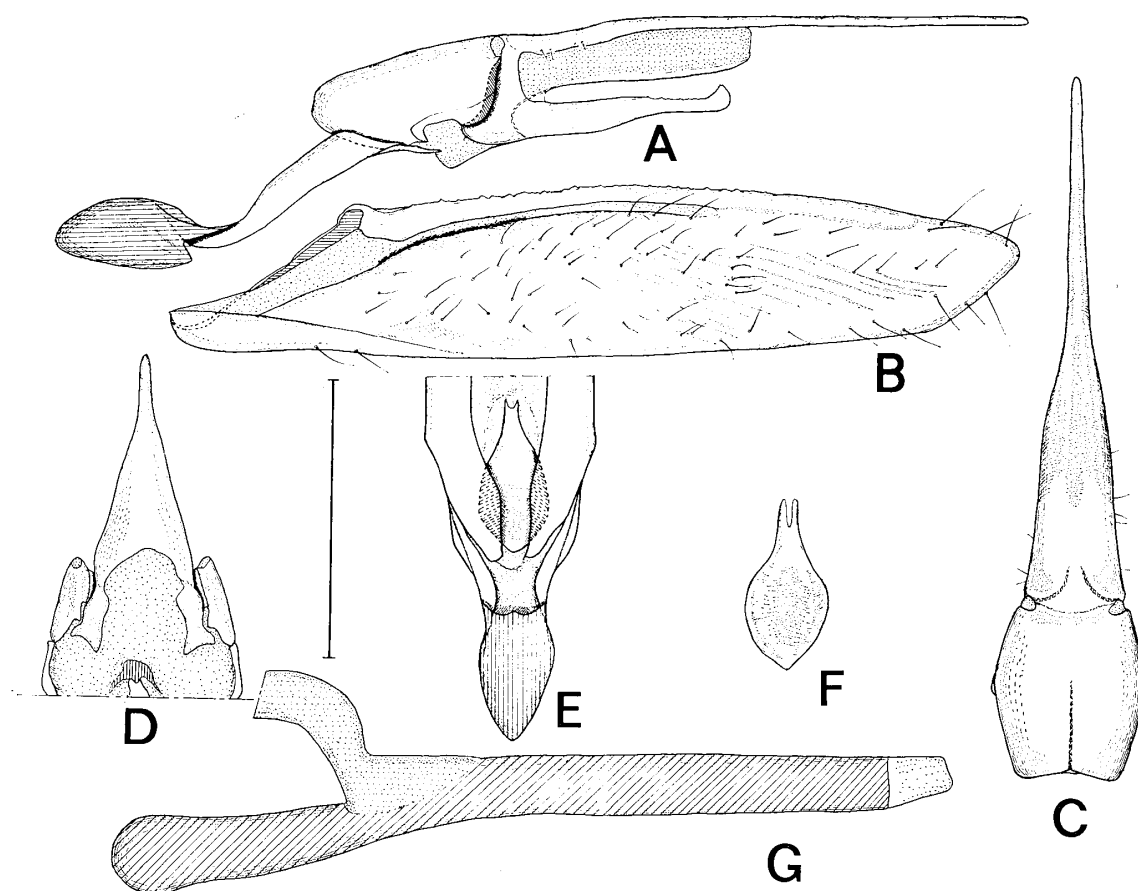


Fig. 1. Male genitalia of *N. saigusai* sp. nov. A. Ring, lateral aspect. B. Right valva, inner aspect. C. Tegumen and uncus, dorsal aspect. D. Gnathos, ventral aspect. E. Saccus, ventral aspect. F. Juxta, ventral aspect. G. Phallus, lateral aspect. (Scale: 0.5 mm)

cornutus. Juxta pear-shaped, with apical portion long, slender and bifurcate at apex.

Hair pencil almost twice as long as 7th tergum and fulvous. Lateral hair tuft on 8th sternum curved and almost as long as 8th sternum.

*Female genitalia:* Ductus bursae about  $1/2$  as long as 7th sternum. Bursa copulatorix long and narrow, but stout at apical  $1/4$ . Area of signa short and relatively narrow, appearing to be represented by a pair of bands along apical stout portion of bursa. Signa consisting of many minute, obliquely arranged spinules; distal spinules long and sparse, medial ones triangular and narrower than in *junctalis*, almost continuous to each other, then forming many oblique lines, and proximal ones wedge-shaped, small and separated.

*Mature larva:* Body length 5.5–7.8 mm, head width 0.73–0.88 mm.

*Head:* Shining black except for brown labrum; all setae relatively shifted forwards. Ocelli I, II and VI larger than the others. Seta AF1\* short,  $1/3$  as long as AF2; puncture AFa nearer to AF2 than to AF1; P1 considerably long, more than twice as long as P2 and dorsad of AF1; A2 nearly  $1/2$  of A1; P2 nearer to P1, just

\* The nomenclature of the setae on head to 9th abdominal segments is followed after HINTON (1946).



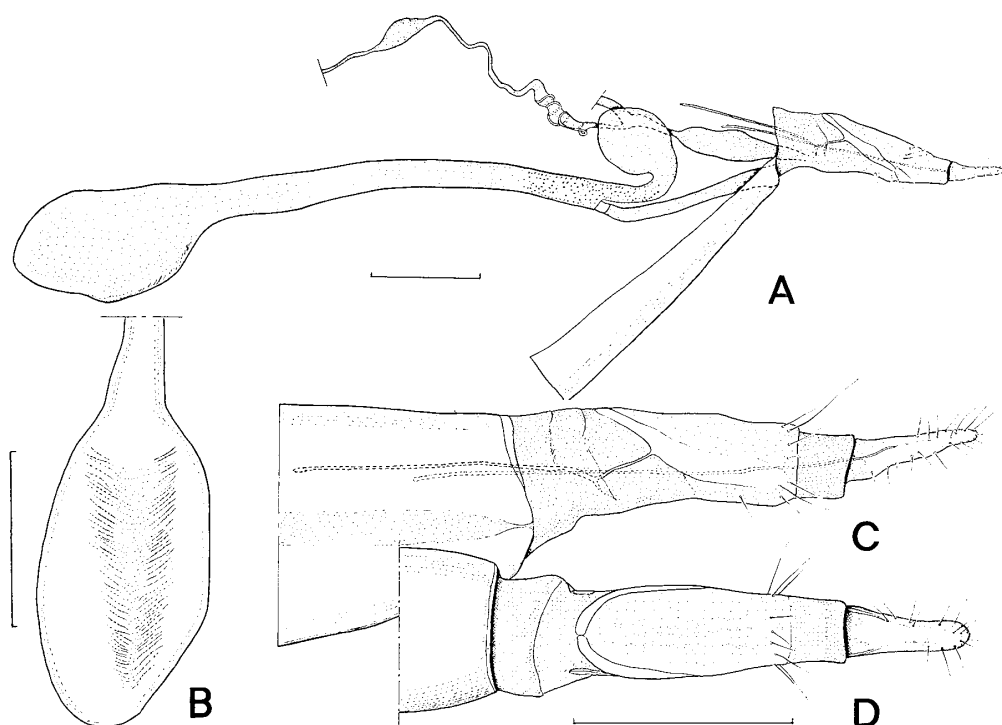


Fig. 2. Female genitalia of *N. saigusai* sp. nov. A. Whole genitalia, lateral aspect. B. Bursa copulatrix. C. 7th to 10th abdominal segment, lateral aspect. D. Ditto, dorsal aspect. (Scale: 0.5 mm)

laterad of AF1; L1 situated posteriorly, then laterad of P1. Labrum with seta La1 longer than M group. Mandible almost as long as wide, with 5 teeth.

Thorax: Integument milky white, somewhat greyish on anterior region, partly covered with many minute spinules. Setae dark brown. Legs dark brown, well developed and each coxa contiguous on mid-ventral line. No seta on ventral region. Prothoracic shield shining black, well developed, including L group of setae; XD group of setae, L1 and SD1 considerably long, directed anteriorly; D2 slightly anterior to D1; SV setae present on a single blackish pinaculum. Meso- and meta-thorax lacking pinaculum, each with one SV seta; setae D2, SD2, L1 and SV1 of each segment long and L2 minute. Setal map as in fig. 3.

Adbomen: Coloration of integument and setae as in thorax. Setae short, especially in D and L group. In 1st to 8th segments, number of setae in D, SD and L group on each segment, 2, 2 and 3 respectively, as in the other Nymphulinae species, and without pinaculum. SV setae 1 (1st & 8th segments), 2 (2nd & 7th) and 3 (3rd–6th) in number; SV setae in 1st and 2nd segments less by one than in other known *Nymphula* and *Parapoynx*-species, and same as in *Eoophyla inouei*. Seta D1 short; D2 long, postero-ventrad from the other two; SV group of setae short except for long SV1 on 1st and 2nd segments. Prolegs small, without normal function of locomotion and shifted laterally in position, having incomplete circle of uniordinal crochets 22–26 in number, anterior crochets comparatively longer than posterior ones. Ninth segment with 2 L setae as in the other species of Nymphulinae except for *Musotima accralaris* and *E. inouei*; setae D2 and SD1 longer than others, L1 almost equidistant

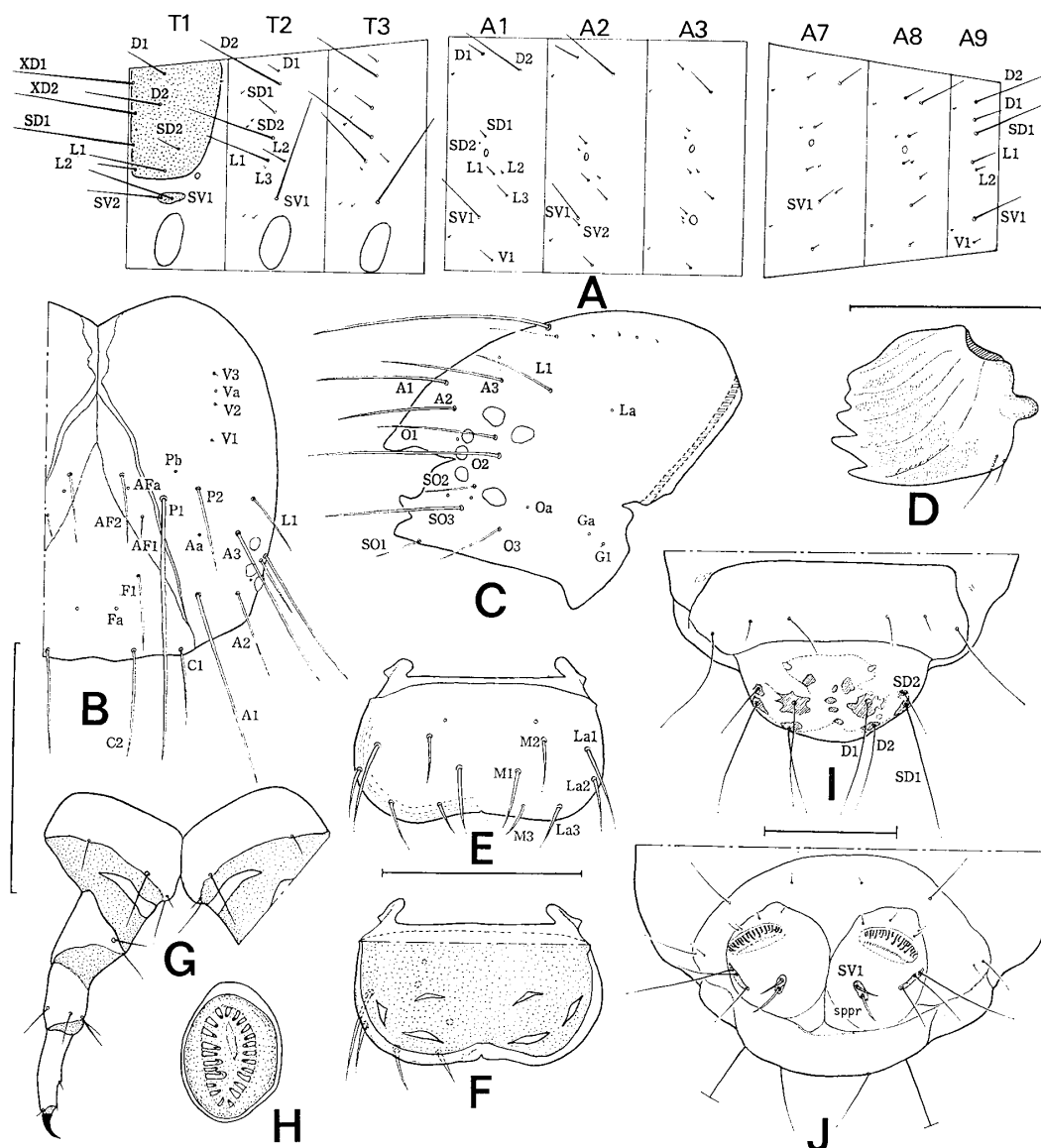


Fig. 3. Mature larva of *N. saigusai* sp. nov. A. Seta map. B. Head, frontal aspect. C. Ditto, lateral aspect. D. Right mandible, inner aspect. E. Labrum, dorsal aspect. F. Ditto, ventral aspect. G. Prothoracic leg. H. Proleg. I. 9th and 10th abdominal segment, dorsal aspect. J. 10th abdominal segment, ventral aspect. (Scale, B, C, G, I, J: 0.5 mm, D, E, F, H: 0.25 mm)

from D2 and SD1; L1 short, less than  $1/2$  of SD1; L2 and V1 much shorter. Tenth segment with anal shield weakly sclerotized, darker near base of setae; seta D1\* short, anterior to D2, almost  $1/2$  as long as D2; SD1 longest, laterad of D2 and posterior to short SD2; these 4 setae arising from sclerotic anal shield. Anal proleg stout, with 16–18, completely biordinal crochets; L group of 3 setae on same narrow pinaculum, L1 longer than others; setae SV1 and sppr posterior to proleg, stout, being on the same distinct pinaculum. Spiracles small, elliptical, almost the same in size throughout segments.

\* The nomenclature of the setae on 10th abdominal segment is followed after ALLYSON (1977).

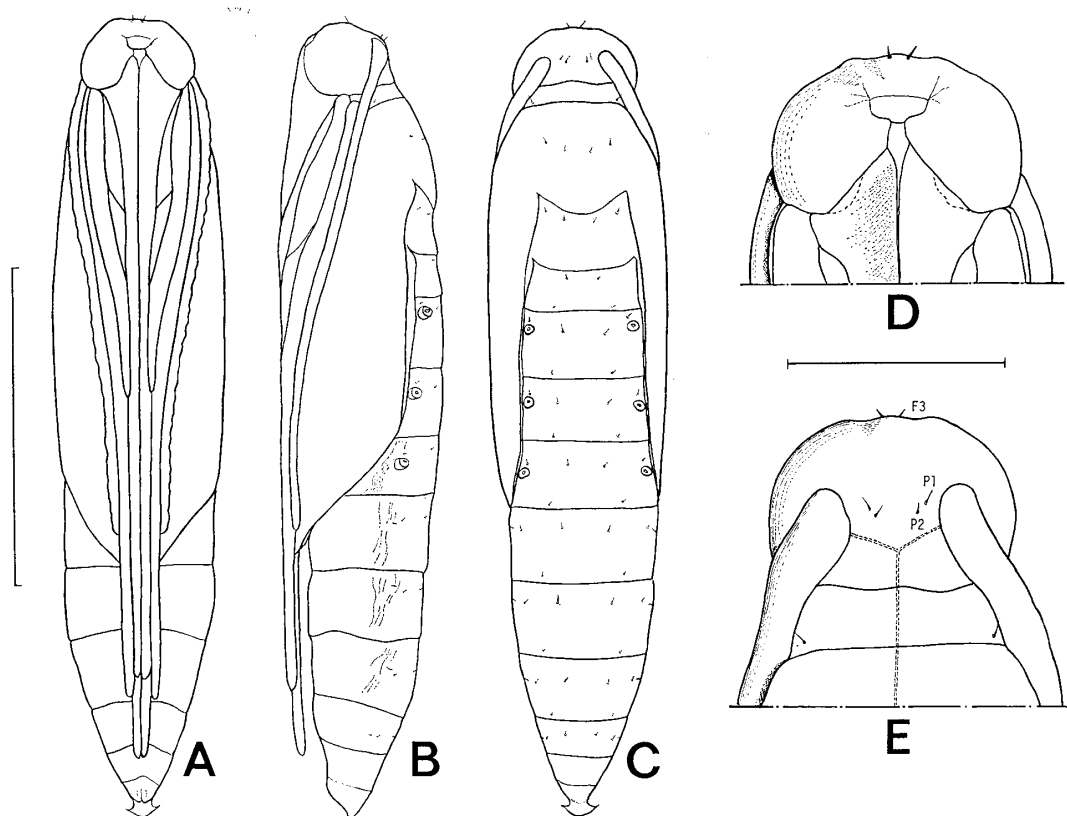


Fig. 4. Pupa of *N. saigusai* sp. nov. A. Ventral aspect. B. Lateral aspect. C. Dorsal aspect. D. Anterior portion, ventral aspect. E. Ditto, dorsal aspect. (Scale, A, B, C: 3 mm, D, E: 1 mm)

**Larval case:** Length 9.5–13.5 mm, width 1.9–2.5 mm (in mature one). Cylindrical in shape, almost circular in transverse section, gently swollen toward middle, slightly curved ventrally; outer surface relatively smooth, inner surface including both flaps thickly lined with silk. Case with an anterior dome-like eaves having a small central pit from which a sealed line runs to anterior margin, and a pair of curved dorso-lateral projections at posterior end. Case also with a relatively thin movable flap below above-mentioned eaves or projection at each end. The case is made of soil particles, usually light brown but variable in color according to soil coloration of habitat.

**Pupa:** Length 6.5–7.4 mm, width 1.5–1.7 mm. Body uniformly pale brown. Head with pilifer not clearly recognized; frons almost flat; antenna usually extending to subapical portion of forewing; galea long, ending slightly before tip of midleg; seta F3 stout and P1 longer than P2. Forewing usually extending to posterior margin of 4th abdominal segment. Foreleg ending at ventral 2/3 between apex of head and wing tips. Mid- and hindlegs extending far beyond forewing, and hindleg longer than midleg. Thorax wider than head, with D1 and D2 setae. Abdomen with several wrinkles from 4th to 8th segment laterally; all setae minute; many minute spinules present from 2nd to 9th segments ventrally; bases of spiracles on 2nd to 4th segments protruded, the other ones reduced. D group of setae 2 in number on 1st to 7th segments, and only D1 on 8th. SD group consisting of 2 setae on 2nd to 8th segments

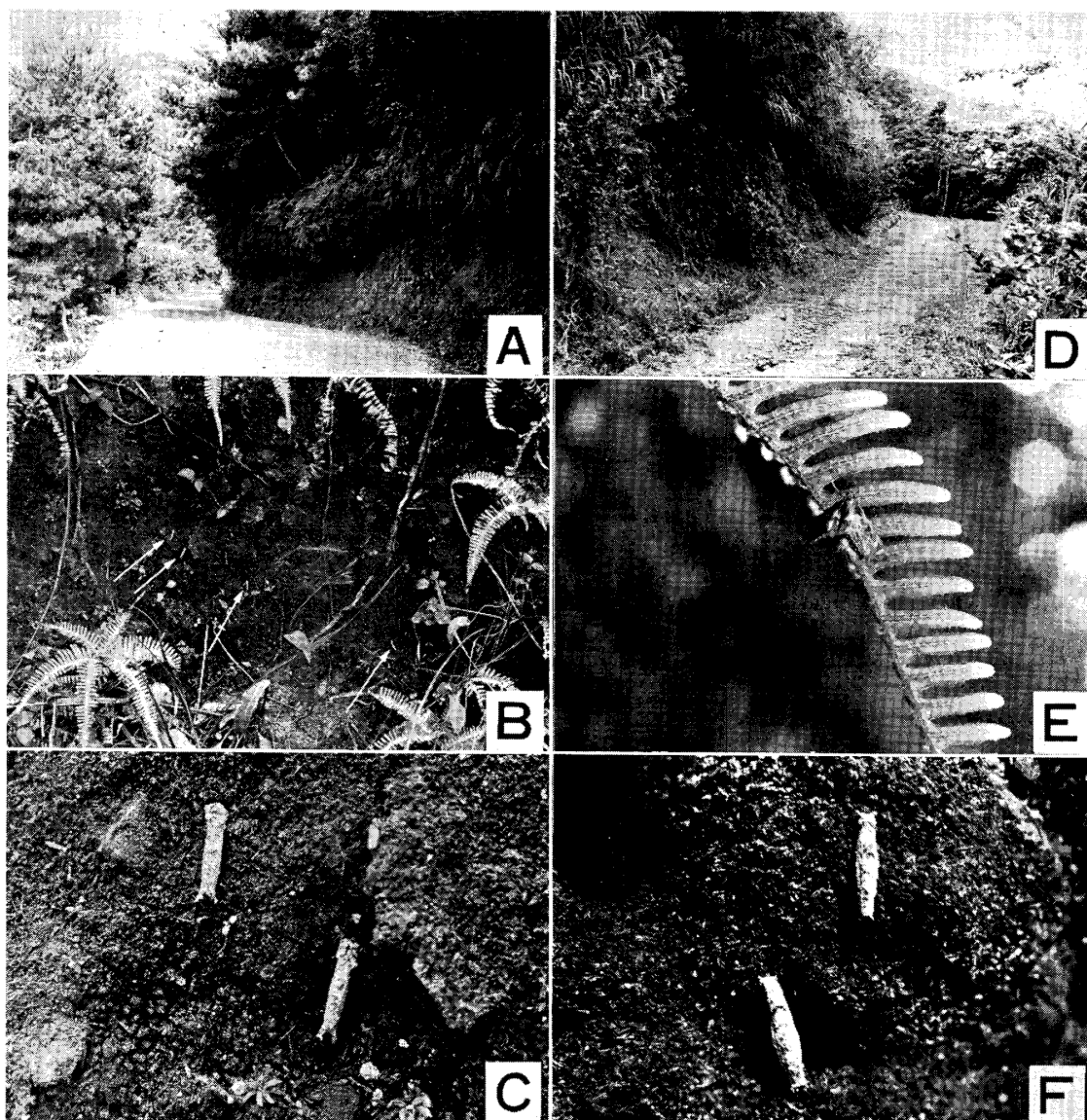


Fig. 5. A. Habitat of *N. saigusai* sp. nov. (Fukuoka, Kyûshû). B. Ditto. C. Ditto, focussed larval case. D. Habitat of *N. juncialis* (HAMPSON) (Naze, Amami-Ôshima). E. Ditto, resting posture of adult. F. Ditto, focussed larval case.

and lacking SD2 on 1st; the setae anterior to spiracles on 1st to 4th and dorsad from those on 5th to 8th. L group of 3 setae on 2nd to 8th segments. Setae of SV group shorter than those of L group, 2 (2nd & 6th), 3 (3rd–5th) and 1 (7th) in number, respectively, but none on 8th. V1 very minute, appearing on 3rd to 8th segments. Ninth and 10th segments without seta and 10th with a pair of lateral projections which are slightly curved and acute at tip.

**Biological notes:** The larvae live on the ground of vertical surface along mountain side of the path. The ground is sparsely covered with their food plants, *Jungermannia truncata* NEES and some kinds of musci. They are case-bearers, and their cases are usually settled vertically on the surface of the ground. Immediately after hatching the larvae enter into minute crevice of the ground where they make small cases by silk mixed with soil particles, and later they add the eaves anteriorly and projections

posteriorly. They move slowly on the ground by thoracic legs and mandibles. After overwintering in mid-instar larvae, they are grown up to the last instar till June to July. Before pupation the larvae attach the anterior ends (sometimes both ends) of the cases to the ground by the silk, and then change the position of their heads to posterior ends of cases and pupate. The pupation takes place in late June to July within the larval case without construction of cocoon. The duration of the pupal stage is about 7 to 10 days. The adults emerge from early July to August and univoltine. They rest keeping their hindwings raised and exposed the posterior margin of hindwings.

*Size of forewing:* Male, 6.2 mm (n=15), female, 6.5 mm (n=15).

*Holotype:* Male, em. 12. vii. 1974, Ozasa, Fukuoka City, Fukuoka Pref., Y. YOSHIYASU.

*Paratypes:* 1 ♀, 11. vii. 1929, Hirao, Fukuoka City, Fukuoka Pref., T. ESAKI *et al.*; 1 ♀, 13. vii. 1930, Beppu, Ōita Pref., T. TORIKATA; 1 ♀, 20. vii. 1934, Mt. Wakasugiyama, Fukuoka Pref., H. HORI *et al.*; 1 ♀, 27. vii. 1934, Mt. Wakasugiyama, Fukuoka Pref., H. HORI; 1 ♀, 30. vii. 1934, Mt. Inunakiyama, Fukuoka Pref., M. FUJINO; 1 ♀, 6–7. vii. 1935, Kashii, Fukuoka City, Fukuoka Pref., T. ESAKI *et al.*; 1 ♀, 11. vii. 1938, 2 ♀, 12. vii. 1938, Mt. Kuboteyama, Ōita Pref., H. HORI *et al.*; 4 ♀, 13. vii. 1938, Mt. Inugatake, Ōita Pref., H. HORI *et al.*, (these in KU); 1 ♀, 26. vii. 1953, Funakoshi, Yokosuka, Kanagawa Pref., H. INOUE (IC); 1 ♀, 4. viii. 1953, Mt. Hikosan, Fukuoka Pref., H. KUROKO (KU); 1 ♂, 26. vii. 1956, Mt. Hikosan, Fukuoka Pref., H. KUROKO (KU); 1 ♂, 27. vi. 1957, Izashiki, Kagoshima Pref., T. SAIGUSA; 1 ♂, 14. vii. 1958, Nashimoto, Shizuoka Pref., H. INOUE (IC); 1 ♂, 2 ♀, 5. vii. 1956, Nashimoto, Shizuoka Pref., H. INOUE (IC); 1 ♂, em. 28. vi. 1971, Kamikumamoto, Kumamoto Pref., Y. YOSHIYASU; 1 ♂, em. 30. vi. 1971, Kamikumamoto, Kumamoto Pref., Y. YOSHIYASU; 1 ♂, em. 25. vi. 1971, Mt. Tachibanayama, Fukuoka Pref., Y. YOSHIYASU; 1 ♂, em. 27. vi. 1972, Mt. Tachibanayama, Fukuoka Pref., Y. YOSHIYASU; 1 ♀, em. 2. vii. 1972, Ozasa, Fukuoka City, Fukuoka Pref., Y. YOSHIYASU; 1 ♂, 1 ♀, 5. vii. 1972, Ino, Kôchi Pref., Y. SUZUKI; 1 ♂, em. 12. vii. 1972, Ozasa, Fukuoka City, Fukuoka Pref., 1 ♂, 31. vii. 1972, Ino, Kôchi Pref., Y. SUZUKI; 1 ♂, em. 8. vii. 1973, Kashii, Fukuoka City, Fukuoka Pref., Y. YOSHIYASU; 1 ♀, 21. vii. 1973, Ichinoseki, Iwate Pref., Y. YOSHIYASU; 2 ♀, em. 12. vii. 1974, Ozasa, Fukuoka City, Fukuoka Pref., Y. YOSHIYASU; 1 ♂, 1 ♀, 17. vii. 1976, Mt. Sanageyama, Aichi Pref., J. EMOTO & M. TAO; 2 ♂, 1 ♀, 30. vii. 1976, Shiiba, Gokano-shô, Kumamoto Pref., K. OHARA *et al.*; 3 ♂, 3 ♀, 1. viii. 1976, Naidaijin, Kumamoto Pref., K. OHARA *et al.*

*Distribution:* Japan (Kyûshû, Shikoku, Honshû).

*Remarks:* The species is rather closely related to *blandialis* by having 4 marginal spots in the hindwing than to the other Japanese species of this genus, but differs from *blandialis* as follows: in *saigusai* with tornal marking in the forewing straight, while in *blandialis* the marking curved; vein  $R_{3+4}$  of forewing stalked with  $R_5$  in *saigusai*, whereas  $R_{3+4}$  stalked with  $R_2$  in *blandialis*.

*Nymphicula junctalis* (HAMPSON, 1891), **comb. nov.**

*Cataclysta junctalis* HAMPSON, 1891, Ill. Het. Coll. Brit. Mus., 8: 140, t. 155, f. 24.

*External structure and coloration:* Head fulvous; frons evenly rounded, wider and flatter than in *saigusai* in some specimens with some brown scales. Maxillary palpus, proboscis and labial palpus almost as in *saigusai*. Antennal scape and dorsal surface of flagellum fulvous.

Thorax including tegula whitish and tinged with fulvous above, whitish below. In male foreleg, coxa fuscous on anterior surface, femur fulvous except for fuscous dorsal surface, whitish on posterior surface and widened distally by scales, tarsus with 1st to 3rd tarsomeres widened, but different from that of *saigusai* in having entirely fulvous scales. Female foreleg without lateral thick scales on tarsus; anterior surface of coxa and dorsal surface of femur fuscous, the others fulvous except for fuscous anterior surface of tibia. Midleg slender, fulvous on anterior surfaces of coxa, femur, tibia and tarsus except for fuscous femoral tip, and whitish on posterior surfaces. Hindleg also slender, coxa with an entirely fulvous tuft of scales on postero-distal portion. Abdomen whitish to fulvous above, whitish below.

*Upperside of forewing:* Ground color pale orange. Fuscous from base to antemedial band, but scattered with pale orange scales on posterior portion. Antemedial band white but fuscous on anterior portion of discal cell, slightly undulate, somewhat expanded distally towards discal cell in comparison with *saigusai*. Intermediate area between antemedial band and medial area pale orange, tinged with fuscous near costa. Medial area trapezoidal in shape, smoky grey as in *saigusai*, darkened on anterior margin of discal cell and becoming almost pale orange near costa. Anterior portion of postmedial band white and weakly arched, running from proximal 2/3 of costa to cell  $M_3$ , making rather an obtuse angle with costa. Both proximal and distal margins of postmedial band bordered with fuscous scales. Posterior portion of postmedial band incorporated with distal margin of medial area and unclear. Submarginal band broad, weakly constricted at costa, then gradually tapering posteriorly and extending to cell  $M_3$ , white to anterior portion of cell  $M_1$  but silvery grey posteriorly, and bordered with fuscous along proximal and distal margins. Ternal marking silvery grey, bordered with fuscous, broad, rounded, with anterior portion completely separated from smoky grey medial area at vein  $CuA_2$  and posterior portion narrowly touching tornus. Apex of wing pale orange, not fuscous as seen in three other Japanese species. Cilia fuscous in proximal 2/5 of outer margin and pale fuscous in distal 3/5 but distinctly yellowish at pretornal area.

*Underside of forewing:* Proximal 2/3 of wing dark brown, cell C often yellowish with fine dark fuscous costa. The other portions almost the same as on the upperside but paler and proximal margin of anterior portion of postmedial band broadly suffused with fuscous. Cilia same as upperside.

*Upperside of hindwing:* Pale orange from base to antemedial band. Intermediate area between antemedial band and medial area pale orange, its anterior portion whitish, mixed with dark brown scales, broader than in *saigusai*, with postero-distal portion separated ternal silvery area into two spots, each at tips of  $1A$  and  $CuP$ , and broadly expanding at distal margin of cell  $CuP$ . Medial area smoky grey as in forewing, bordered with fine whitish line arising from subapical portion, running parallel with wing margin and ending at ternal silvery spot. Marginal blackish line at middle 1/3 of costa usually absent, but in some specimens very weakly visible.

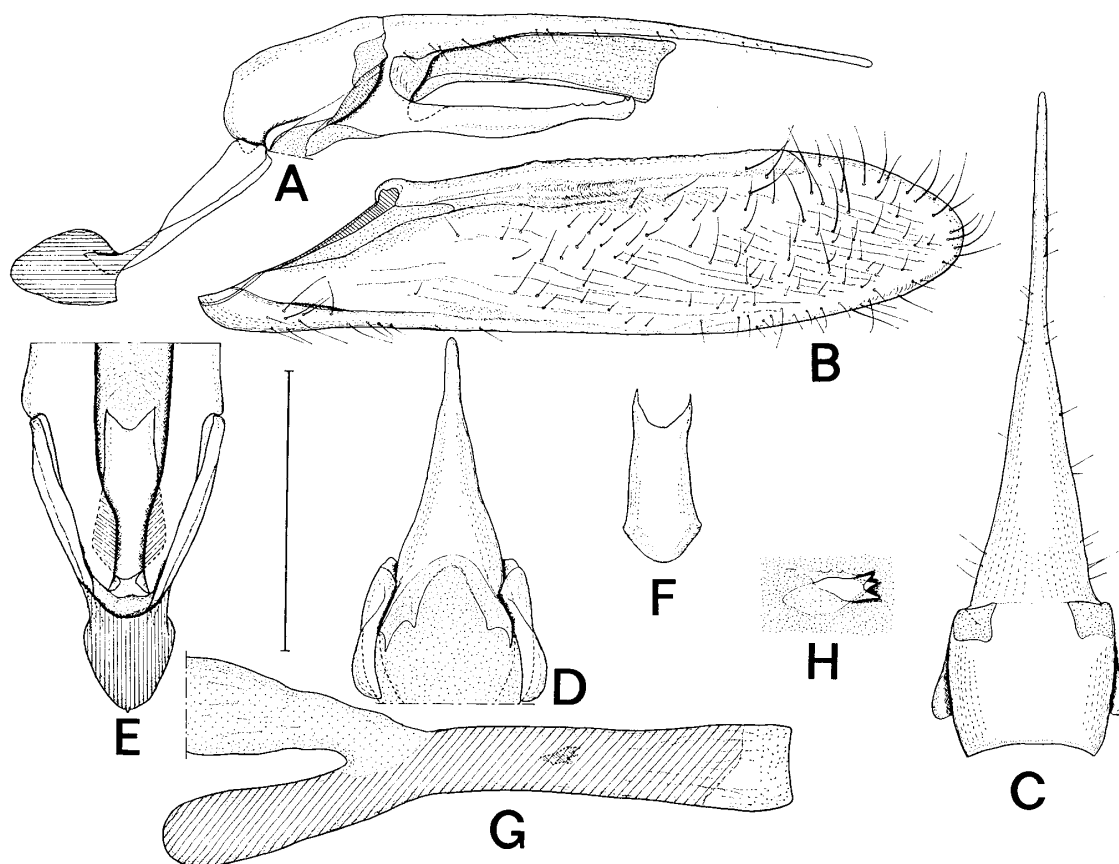


Fig. 6. Male genitalia of *N. junctalis* (HAMPSON). A. Ring, lateral aspect. B. Right valva, inner aspect. C. Tegumen and uncus, dorsal aspect. D. Gnathos, ventral aspect. E. Saccus, ventral aspect. F. Juxta, ventral aspect. G. Phallus, lateral aspect. H. Cornutus. (Scale: 0.5 mm)

Submarginal line fuscous, narrow and undulate. Marginal spots black, 5 in number, incompletely separated from each other; metallic blue scales present between them and on middle of 5th spot. Proximal margin of black spots without pale orange border, and apex anterior to 1st marginal spot also pale orange. Cilia of outer margin almost as in *saigusai*.

*Underside of hindwing*: Almost same as upperside, but differing in the following points. Markings more indistinct. Whitish from base to antemedial band. Discocellular lunule and intermediate area paler than upperside. Medial area fuscous without silvery scales in distal end of cell CuP. Marginal spots slightly paler than in upperside.

*Male genitalia*: Tegumen wide, almost as long as or shorter than wide, not anteriorly protruded in lateral view, with anterior margin almost straight in dorsal view, and without a dorsal longitudinal ridge. Fenestrulae broad, nearly semicircular in shape, sclerotized portion between fenestrulae 1/3 as wide as tegumen. Vinculum relatively wide and strongly tapering towards saccus. Saccus elliptical in shape laterally, shorter than in *saigusai*. Uncus almost as in *saigusai*, a little curved downwards, about 1.25 times as long as height of ring and with sparse setae laterally. Gnathos well developed, narrowly fused with uncus, produced into a long cochlear

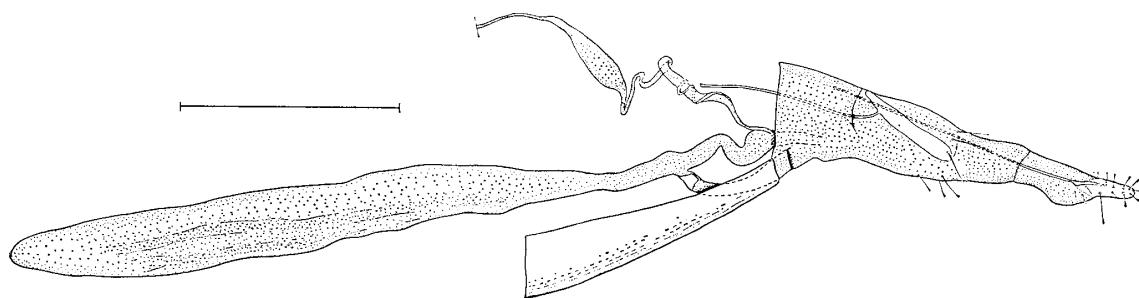


Fig. 7. Female genitalia of *N. junctalis* (HAMPSON), lateral aspect. (Scale: 1 mm)

which is swollen near middle in lateral view and furnished dorsally with some small denticles at apical 1/2, apex of cochlear almost reaching middle of uncus. Valva long, almost parallel-sided, 4.4 times as long as wide, weakly arched dorsal margin and broadly rounded distal margin; inner surface of valva bearing many long setae which are not differentiated at apical portion. Phallus relatively thick, nearly twice as long as height of ring and strongly curved downwards beyond base of bulbus ejaculatorius; coecum penis about 0.31 of whole length of phallus; vesica with a distinct cornutus which has 3 short processes. Juxta long, with proximal margin broadly rounded, apical portion much wider than in *saigusai* and weakly emarginate.

Hair pencil almost as long as 7th tergum and fulvous. Lateral hair tuft on 8th sternum straight and longer than 8th sternum.

*Female genitalia:* Ductus bursae a little shorter than in *saigusai*, about 2/5 as long as 7th sternum. Bursa copulatorix long and evenly slender. Area of signa long and wider than in *saigusai*, appearing to form a pair of long, rather scorbrate bands which are nearly 2/3 as long as bursa. Signa consisting of many obliquely arranged spinules as in *saigusai*; distal spinules sparse and long, medial ones wider than in *saigusai* and separated from each other, proximal ones also separated and with apical tips longer and narrower than in *saigusai*.

*Mature larva:* Body length 8.0–10.1 mm, head width 0.95–1.05 mm. Closely resembling *saigusai*, but differing in the following characters. Head: Seta AF1 longer, almost as long as AF2; P1 longer, more than twice as long as P2; P2 ventrad from AF2; L1 shifted more anteriorly and ventrad from P1. Labrum with M2 situated more latero-dorsad. Mandible longer than wide.

Throax: Setae on meso- and meta-thorax shorter, especially L1 and SV1.

Abdomen: First to 8th segments each with seta L1 shorter; D2 longer, situated more laterally; SD1 longer, almost 1/2 as long as D2; SD2 minute; L group of setae as in *saigusai*; SV1 shorter except for that on the 1st. Prolegs with crochets fewer in number. Ninth segment with setae D2 and SD1 longer; D1 longer, about 1/2 as long as SD1. Tenth segment with anal shield well sclerotized having several dark maculations; setae SD1 and SD2 shifted more anteriorly, then L1 seta just laterad of SD1; SD2 excluded from anal shield. Anal proleg with 13–16 crochets in incompletely biordinal rows; setae SV1 and sppr slender as in other setae and not arising from pinaculum.

*Larval case:* Length 10.5–14.5 mm, width 2.4–3.3 mm (in mature one). Cylindrical in shape but slightly flattened; in younger larval case slender and curved



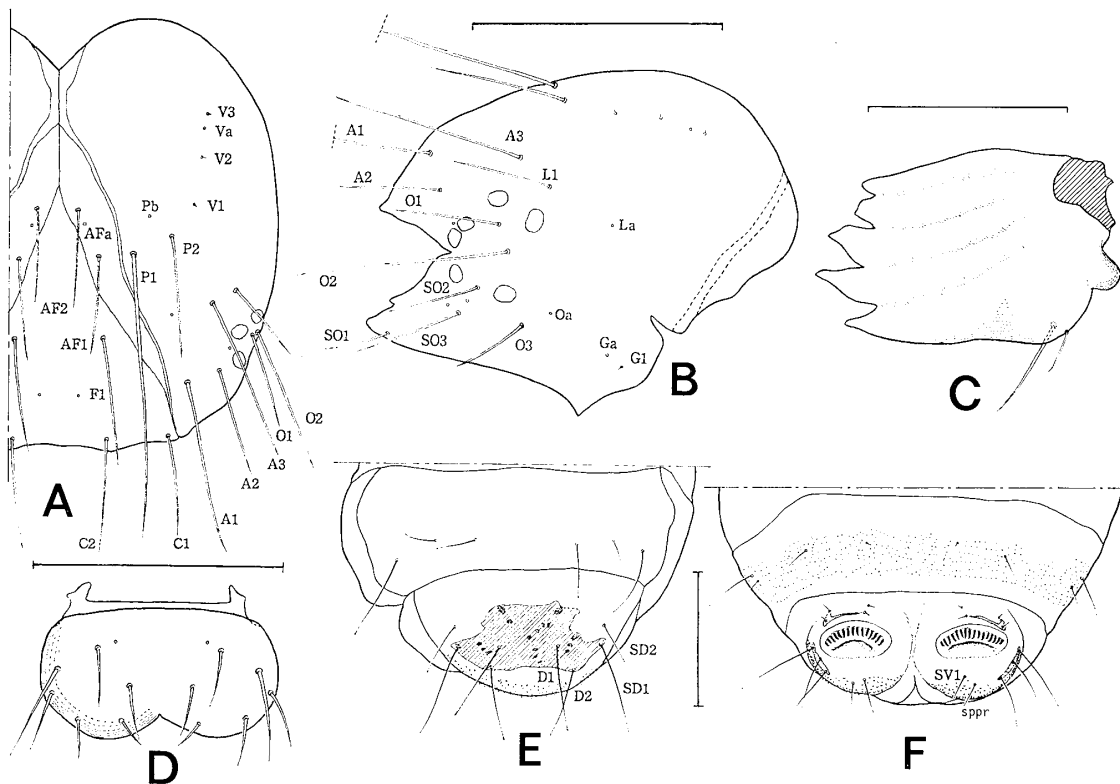


Fig. 8. Mature larva of *N. junctalis* (HAMPSON). A. Head, frontal aspect. B. Ditto, lateral aspect. C. Right mandible, inner aspect. D. Labrum, dorsal aspect. E. 9th and 10th abdominal segment, dorsal aspect. F. Ditto, ventral aspect. (Scale, A, B, D, E, F: 0.5 mm, C: 0.25 mm)

ventrally; in mature case almost straight, more strongly swollen at middle than in *saigusai*, and narrowing towards both ends; outer surface rougher than in *saigusai*. Dorsal cover at both ends represented by a pair of dorso-lateral projections which are more straight, and shorter than in *saigusai* and anterior ones do not form a dome-like eaves as seen in *saigusai*.

**Pupa:** Length 8.1–8.7 mm, width 1.7–1.8 mm. Closely resembling that of *saigusai*, but distinguishable from it by the following characters. Head with frons more produced; pilifer swollen, more clearly separated by half-extending suture from labrum; galea shorter and extending to about a half way from tip of head to forewing tip; setae F3, P1 and P2 absent. Abdomen with D1 seta of D group on 1st to 8th segments, D2 absent; 8th segment with 1 SD seta; L group of setae 3 in number on 3rd to 7th, L3 absent on 2nd, and no L seta on 8th segment.

**Biological notes:** The habitat, feeding behavior, food plants and pupation site are quite similar to those of *saigusai*, but the larvae are living in drier habitat than those of the latter. Life cycle is unknown, but it may be bivoltine, judging from the collecting data of adults and larvae and the emerging period of adults reared in the laboratory. The first appearance of adults is late May and the 2nd in August. The overwintering stage is not confirmed.

**Size of forewing:** Male, 6.7 mm (n=15), female 7.1 mm (n=15).

**Specimens examined:** All specimens collected at Amami-Ôshima, Amami Is.

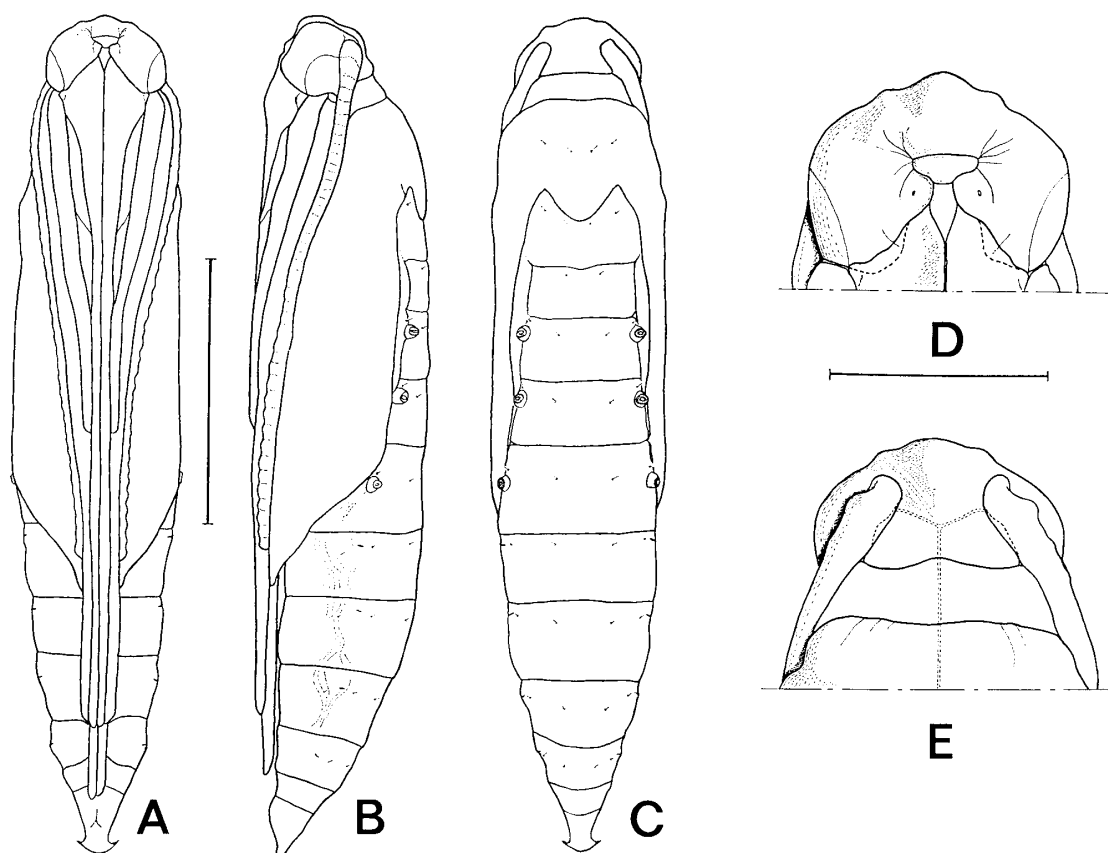


Fig. 9. Pupa of *N. junctalis* (HAMPSON). A. Ventral aspect. B. Lateral aspect. C. Dorsal aspect. D. Anterior portion, ventral aspect. E. Ditto, dorsal aspect. (Scale, A, B, C: 2.5 mm, D, E: 1 mm)

1 ♀, em. 12–14. v. 1972, Yuwan, Y. YOSHIYASU; 1 ♂, 21. v. 1972, Koniya, Y. YOSHIYASU; 2 ♂, 1 ♀, 22. v. 1972, Koniya, Y. YOSHIYASU; 1 ♀, em. 23. vi. 1972, Koniya, Y. YOSHIYASU; 3 ♂, 2 ♀, 23. v. 1972, Yuwan, Y. YOSHIYASU; 1 ♂, 1 ♀, 24. v. 1972, Yuwan, Y. YOSHIYASU; 1 ♂, 21. v. 1973, Nishinakama, H. MAKIHARA; 2 ♀, 25. v. 1973, Naze, H. MAKIHARA; 1 ♀, 21. viii. 1973, Taken, Y. YOSHIYASU; 1 ♂, em. 4. vi. 1974, Naze, H. MAKIHARA; 3 ♂, 3 ♀, em. 14–17. v. 1976, Hatsuno, H. MAKIHARA; 10 ♂, 15 ♀, em. 30. v.–16. vi. 1977, Yuwan, Y. YOSHIYASU,

*Distribution:* India, Japan (Amami-Ōshima).

*Remarks:* This species has been treated as a synonym of *N. blandialis* since HAMPSON's paper in 1896. However, the specimens from Amami-Ōshima, which are identical to *junctalis* HAMPSON, are different from *blandialis* in having straight and shorter tornal marking in the forewing and 5 marginal spots in the hindwing. Therefore, I treated *junctalis* as a good species distinct from *blandialis* in the present paper.

### *Nymphicula albibasalis* sp. nov.

*External structure and coloration:* Head fulvous, frons evenly rounded as in *saigusai*, in some specimens mixed with some brown scales. Maxillary palpus, proboscis and labial palpus as in *saigusai*, but 3rd segment of labial palpus fuscous on

posterior surface. Antennal scape in male fuscous on anterior surface, fulvous on posterior surface; in female fulvous with some fuscous scales on anterior surface, flagellum with dorsal surface fulvous and mixed with some fuscous scales.

Thorax including tegula fulvous to whitish above, whitish below, in most specimens tegula bearing some fuscous scales. In male foreleg coxa, femur and tibia as in *saigusai*, tarsus slender, evenly fulvous, and without special scales, which are found in the other Japanese species, on 1st to 3rd tarsomeres. Female foreleg slender as in male; anterior surface of coxa and dorsal surface of femur fuscous, other portions fulvous to whitish except for fuscous anterior surface of tibia. Midleg slender, anterior surface of femur fuscous distally, proximal 1/2 of anterior surface of tibia fuscous, otherwise fulvous. Hindleg slender, coxa with a tuft of fuscous scales on postero-distal portion; femur, tibia and tarsus fulvous to whitish except for fuscous tip on anterior surface of femur. Abdomen as in *saigusai*.

*Upperside of forewing:* Ground color pale orange. Fuscous from base to antemedial band. Antemedial band white, infuscated on costal area, almost straight and running inwards. Intermediate and medial areas contiguous, forming a broad smoky grey distal area, no pale orange scales appearing on the area except on costal margin. Anterior portion of postmedial band white, almost perpendicular to costa, straight, running from proximal 3/4 of costa to vein  $M_3$ . The band bordered proximally with fuscous scales, but in some specimens fuscous proximal border indistinct. Posterior portion of postmedial band incorporated into distal margin on medial area and almost unrecognizable. Submarginal band moderately broad, somewhat expanding distally in its anterior portion, slightly tapering on posterior 1/2, and extending to or slightly beyond vein  $CuA_1$ . The band white from costa to vein  $M_1$ , changing into silvery grey beyond the vein and bordered with fuscous scales along proximal and distal margins; fuscous proximal border dilated towards costa. Tornal marking silvery grey, bordered with fuscous, with anterior portion curved proximally along vein  $CuA_1$ , connected with medial area and with posterior portion broadly connected with tornus. Apex of wing with narrow fuscous margin. Cilia fuscous in proximal 2/5 of outer margin, paler in distal 3/5 except for yellowish pretornal area.

*Underside of forewing:* Proximal 2/3 of wing almost evenly fuscous, discocellular pale orange, somewhat dark-bordered. Tornal marking broadly fuscous-bordered, with proximal area connected with medial area.

*Upperside of hindwing:* Basal 1/3 of wing including antemedial area extensively white. Intermediate area, which is pale orange in *saigusai*, almost fuscous, with dark silvery grey tornal marking tinged with a small orange speckle. Discocellular lunule white, more or less clearly encircled with fuscous scales. Medial area smoky grey as in forewing, bordered distally with fine white line arising from subapical portion, running parallel with wing margin and ending at tornal silvery area. Submarginal line fuscous, arising from blackish apex of wing and slightly undulate. Marginal spots black, 5 in number, incompletely separated from each other, almost subequal in size, but in most specimens 2nd and 5th spots slightly larger than the others; metallic blue scales on posterior portion of each 1st to 4th spots and on center of 5th spot. Anterior portion of the 1st spot narrowly expanded toward apex of wing along wing margin, so the apex becoming black without pale orange scaling. Marginal area be-

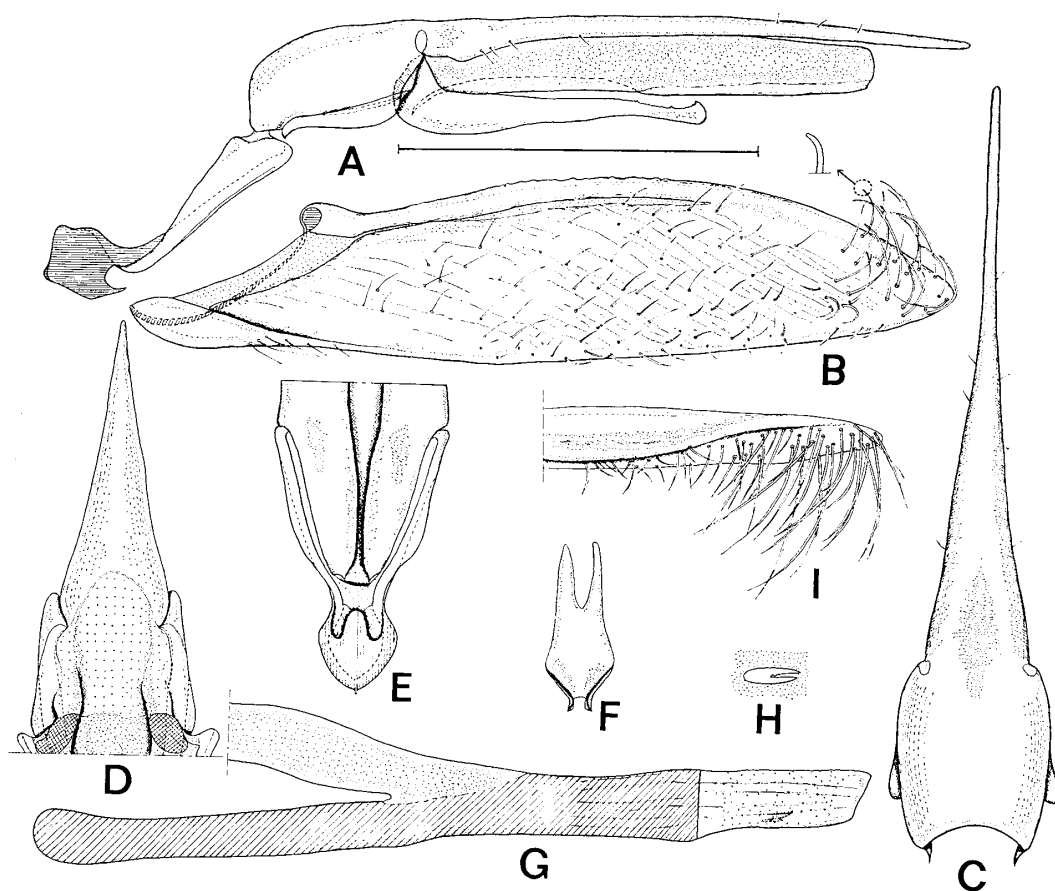


Fig. 10. Male genitalia of *N. albibasalis* sp. nov. A. Ring, lateral aspect. B. Right valva, inner aspect. C. Tegumen and uncus, dorsal aspect. D. Gnathos, ventral aspect. E. Saccus, ventral aspect. F. Juxta, ventral aspect. G. Phallus, vateral aspect. H. Cornutus. I. Apical portion of right valva, dorsal aspect. (Scale: 0.5 mm).

tween marginal spots pale orange. Cilia of outer margin almost as in *saigusai*, but without orange cilia at tornal area.

*Underside of hindwing*: Almost as in upperside, but different in the following points. Markings more indistinct. Intermediate area between antemedial band and medial area whitish, and pale orange tornal spot paler than upperside. Submarginal band weaker, marginal black spots without metallic blue scales.

*Male genitalia*: Tegumen relatively narrow, longer than wide, not anteriorly protruded, almost straight in lateral view, with anterior margin weakly emarginate in dorsal view. Fenestrulae small as in *saigusai*. Vinculum broader than that of other Japanese species at apical portion, strongly tapering to saccus. Saccus short, nearly rectangular in lateral view. Uncus almost as in *saigusai*, about 1.45 times as long as height of ring, with sparse setae laterally. Gnathos long, narrowly articulated with uncus, otherwise almost as in *saigusai*, but apex of cochlear reaching middle of uncus. Valva long, 4.5 times as long as wide, with dorsal margin distinctly arched and ventro-distal portion much produced; inner surface of valva bearing many setae which are longer and suberect at distal portion of valva. Phallus slender, nearly twice as long as height of ring, almost straight; coecum penis long, about 0.42 of whole length of

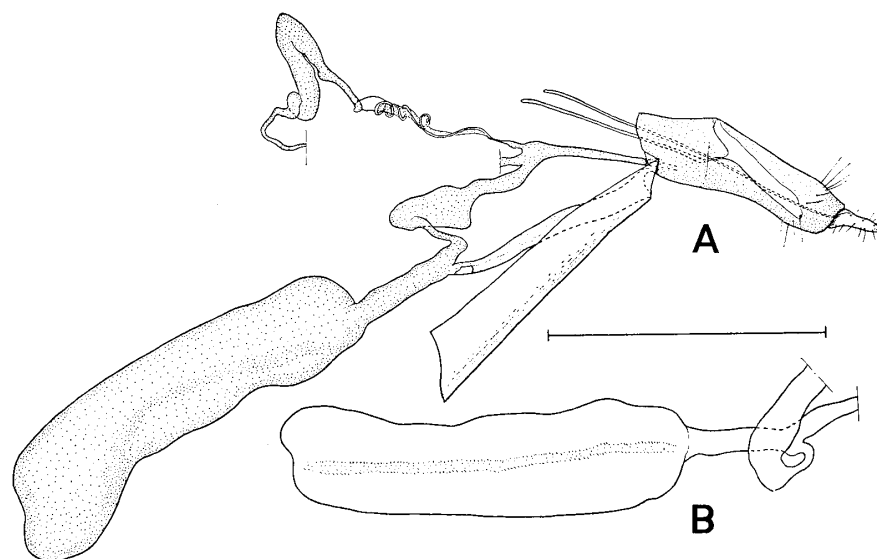


Fig. 11. Female genitalia of *N. albibasalis* sp. nov. A. Whole genitalia, lateral aspect. B. Bursa copulatorix. (Scale: 1 mm)

phallus; vesica with a cornutus smaller than in *junctalis*. Juxta almost parallel-sided, proximal portion bearing a pair of small projections, and apical portion deeply emarginate.

Hair pencil almost twice as long as 7th tergum and fulvous. Lateral hair tuft on 8th sternum straight and shorter than 8th sternum.

**Female genitalia:** Ductus bursae long, about  $3/4$  as long as 7th sternum. Bursa copulatorix long, about twice as long as 7th sternum, slender on basal  $1/5$ , stout on apical  $4/5$ . Area of signa narrow and long throughout apical stout portion, appearing to form a pair of indistinguishable bands. Signa composed of many minute, almost transversely arranged spinules; distal spinules sparse, narrow, with apical tips acute; medial and proximal ones relatively wide, with apical tips shorter than in *junctalis* and some spinules connected with each other at bases.

**Size of forewing:** Male, 5.5 mm ( $n=15$ ); female, 5.3–6.3 mm.

**Immature stages:** Unknown.

**Holotype:** Male, 1. viii. 1976, Naidaijin, Kumamoto Pref., K. OHARA *et al.*

**Paratypes:** 2 ♂, 17. vii. 1930, Beppu, Ōita Pref., T. TORIKATA; 1 ♂, 18. vii. 1933, Kirishima-shinyu-Myôban, Kagoshima Pref., H. HORI & M. FUJINO; 1 ♂, 23. vii. 1954, Mt. Hikosan, Fukuoka Pref., H. KUROKO, (these in KU); 1 ♀, 3., 1 ♂, 7., 1 ♀, 9., all in viii. 1972, Ino, Kôchi Pref., Y. SUZUKI; 1 ♂, 25. vii. 1973, Yabakei, Ōita Pref., Y. SUZUKI & M. TAKAGI; 1 ♂, 27. vii. 1976, Kurino, Kirishima, Kagoshima Pref., Y. YOSHIYASU *et al.*; 1 ♂, 30. vii. 1976, 4 ♂, 2 ♀, 31. vii. 1976, Shiiba, Gokanoshô, Kumamoto Pref., K. OHARA *et al.*; 4 ♂, 1 ♀, 1. viii. 1976, Naidaijin, Kumamoto Pref., K. OHARA *et al.*

**Distribution:** Japan (Kyûshû, Shikoku).

### *Nymphicula minuta* sp. nov.

*Cataclysta junctalis*: MARUMO, 1923, J. Coll. Agr. Tokyo Imp. Univ., 8: 187.

**External structure and coloration:** Head fulvous, frons evenly rounded. Maxil-

lary palpus and proboscis as in *saigusai*. Labial palpus long, outer surface of 1st segment fulvous and with some fuscous scales, 2nd and 3rd segments almost evenly fulvous, the latter acute at tip (The coloration of labial palpus is described on the specimens in a poor condition, confirmation on better ones is needed.) Antennal scape in male fuscous on anterior surface, fulvous on posterior surface, evenly fulvous in female; flagellum fulvous.

Thorax fulvous to whitish above, whitish below. In male foreleg, coxa fulvous except for fuscous anterior surface; femur and tibia fuscous from dorsal to anterior surface; tarsus widened by blackish scales on 1st to 3rd tarsomeres. Female foreleg slender; anterior surface of coxa and dorsal surface of femur fuscous, otherwise fulvous; tibia with distal portion fuscous on posterior surface and other portions fulvous; tarsus evenly fulvous. Midleg slender, coxa fulvous; femur fuscous on dorsal surface, fulvous on outer surface; tibia fulvous, though the proximal end is fuscous on the dorsal surface; tarsus whitish to fulvous. Hindleg also slender and fulvous to whitish, in both sexes coxa with a tuft of fuscous scales on postero-distal portion. Abdomen slender, fulvous above, whitish below.

*Upperside of forewing*: Ground color pale orange. Fuscous from base to antemedial band and mixed with pale orange scales proximally. Antemedial band white except for fuscous area around costal margin, almost straight and running inwards, its distal margin not bordered with fuscous scales. Intermediate area between antemedial band and medial area entirely pale orange, wider than that of other Japanese species. Medial area trapezoidal in shape, smoky grey as in *saigusai*, tinged with fuscous near costa. Anterior portion of postmedial band a little broader than that of other Japanese species, white, but suffused yellowish near costa, making rather an obtuse angle with costa, straight and running from about 2/3 of costal margin to vein CuA<sub>1</sub>. Both proximal and distal margins of the band bordered with dark brown scales. Posterior portion of the band incorporated into distal margin of medial area and unclear. Submarginal band moderately broad, slightly tapering posteriorly and extending near middle of cell M<sub>3</sub>. The band white anterior to vein R<sub>5</sub> and bordered with dark brown along proximal and distal margins, proximal border much dilated towards costa but distal border disappearing near costa. Tonal marking silvery grey, bordered with fuscous, band-like, narrower than in *albibasalis*, with anterior portion more strongly curved proximally along vein CuA<sub>1</sub> and connected with medial area, and with posterior portion narrowly touched tornus. Apex of wing with narrow fuscous margin. Cilia fuscous in proximal 2/5 of outer margin and becoming paler in distal 3/5.

*Underside of forewing*: Proximal 2/3 of wing fuscous, with apical portion of cell Sc yellowish, costal margin darker. Markings on distal 1/3 of wing more indistinct than those on upperside, tonal marking much obscure on its proximal portion. Cilia as in upperside.

*Upperside of hindwing*: White from base to antemedial band and partly scattered with dark brown scales. Antemedial band white, extending outwards. Intermediate area between antemedial band and medial area pale orange, and mixed with fuscous scales on anterior portion, constricted at subtonal area, then separating tonal silvery area into dark silvery grey tonal marking and silvery apical portions of cells CuA<sub>2</sub>

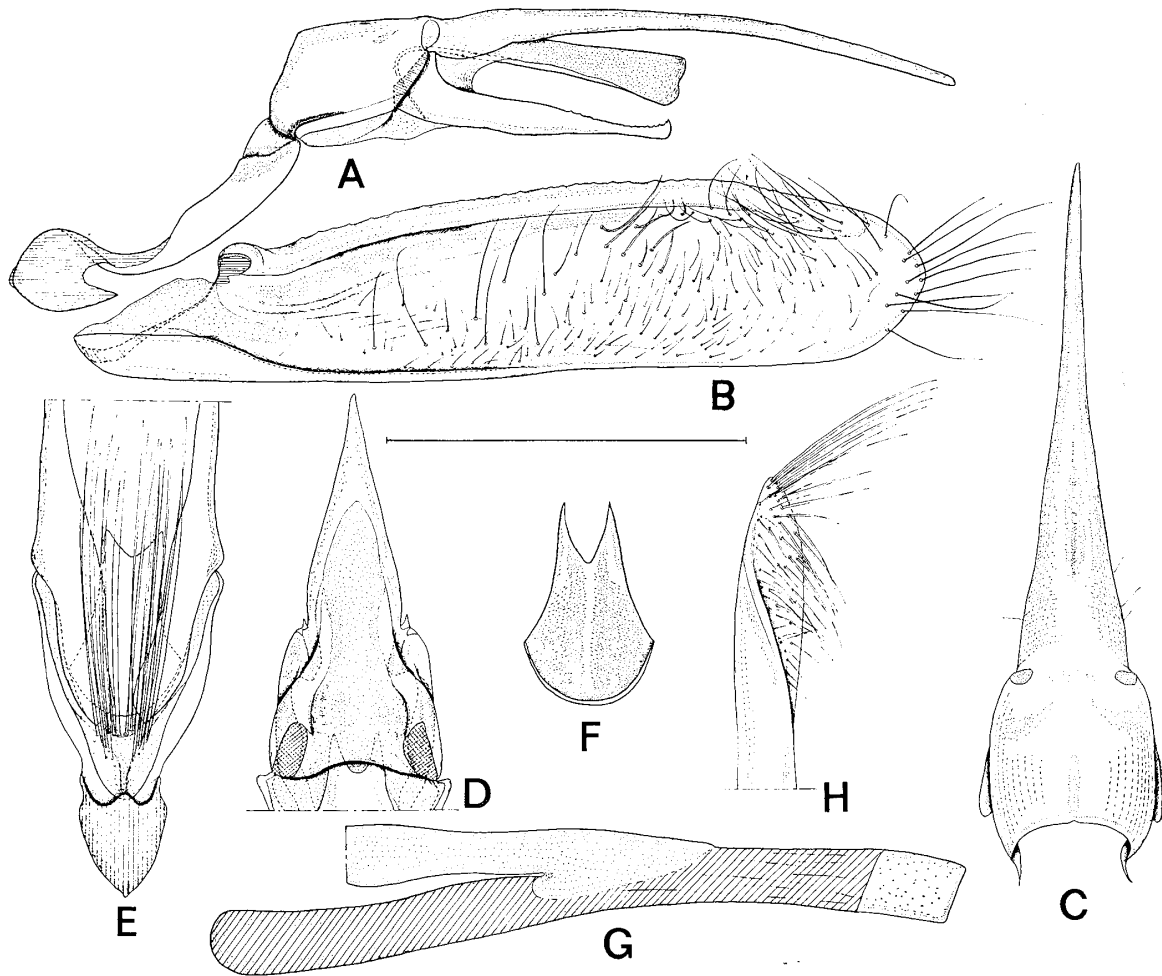


Fig. 12. Male genitalia of *N. minuta* sp. nov. A. Ring, lateral aspect. B. Right valva, inner aspect. C. Tegumen and uncus, dorsal aspect. D. Gnathos, ventral aspect. E. Saccus, ventral aspect. F. Juxta, ventral aspect. G. Phallus, lateral aspect. H. Apical portion of right valva, dorsal aspect. (Scale: 0.5 mm)

and CuP, and broadly expanding along outer margin of cell CuP. Discocellular lunule white, rather unclearly bordered. Medial area smoky grey as in forewing, without fuscous linear marking in costal margin, bordered distally with fine white lines arising from subapical portion. Submarginal line fuscous, narrow, and weakly undulate. Marginal spots black, 5 in number, incompletely separated from each other, the 3rd smallest, accompanying with pale orange scales between marginal spots in addition to ordinary ones on wing margin; metallic blue scales present between the spots and on center of 5th spot. Apex of wing anterior to 1st marginal spot pale orange. Cilia of outer margin almost as in *saigusai*.

*Underside of hindwing:* Almost same as upperside, but differing in the following points. Markings more indistinct. Proximal regions including antemedial band white. Discocellular lunule and intermediate area paler than upperside. Medial area evenly fuscous. Submarginal line almost absent. Each marginal spot subequal in size. Distal end of cell CuA<sub>2</sub> broadly suffused with metallic scales, which also cover the posterior portion of 5th marginal spot.

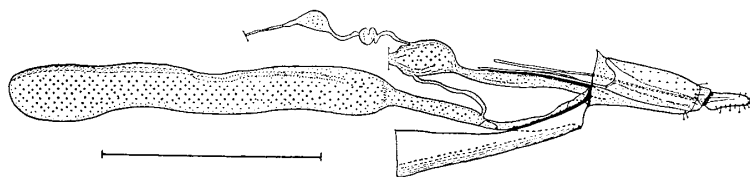


Fig. 13. Female genitalia of *N. minuta* sp. nov. (Scale: 1 mm)

**Male genitalia:** Tegumen relatively narrow, almost as long as wide, not protruded anteriorly in lateral view, with anterior margin weakly emarginate in dorsal view, and with a weak, dorsal longitudinal ridge on anterior 1/2. Fenestrulae small. Vinculum narrowest at apical portion among Japanese species. Saccus almost as in *albibasalis* in shape. Uncus aristate in shape, weakly curved downwards in lateral view, about 1.35 times as long as height of ring, with sparse setae laterally. Gnathos short, narrowly articulated with uncus, produced into a long cochlear which tapers apically, furnished dorsally with some small denticles at apical 1/2 and ending in slightly swollen tip; apex of cochlear not reaching middle of uncus. Valva long, nearly parallel-sided, 4.7 times as long as wide, with dorsal margin weakly arched and distal margin broadly rounded; inner surface of valva bearing many setae, which are long and directed posteriorly at apical portion of valva. Phallus slender, nearly twice as long as height of ring, almost straight; coecum penis long, about 0.43 of whole

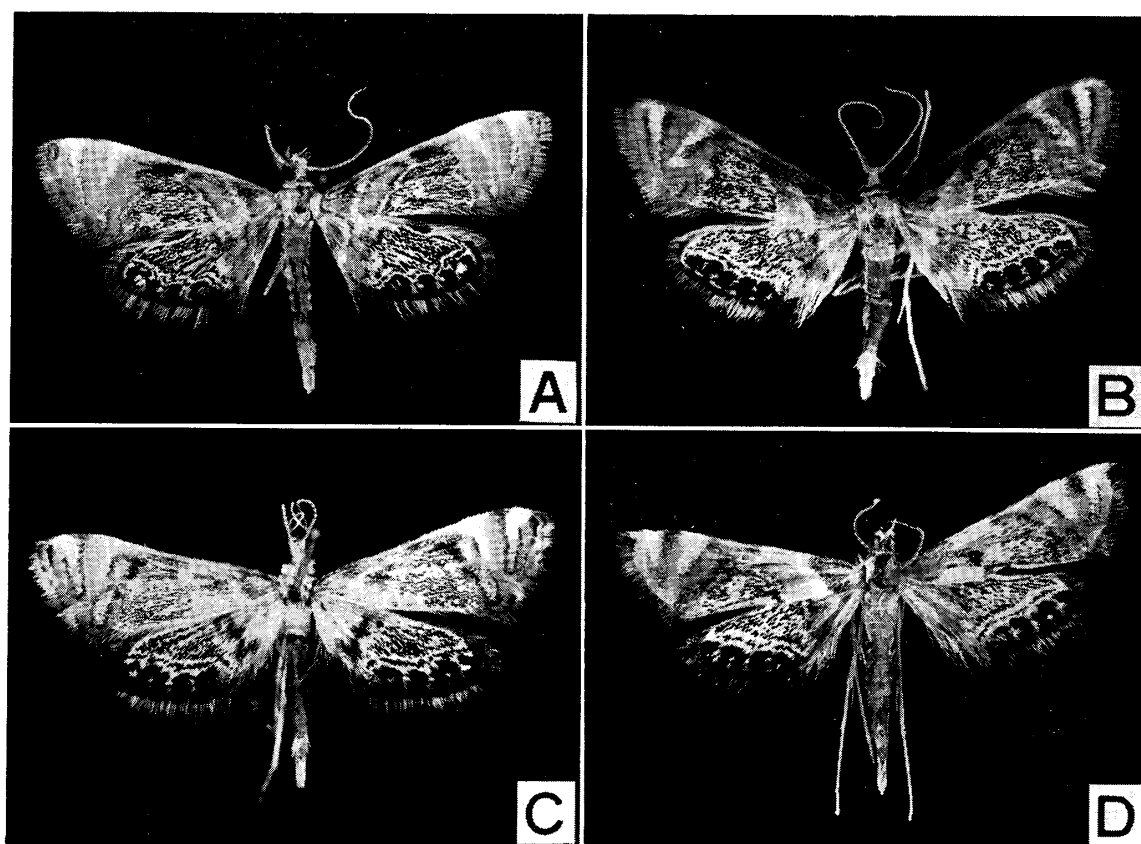


Fig. 14. A. *N. saigusai* sp. nov., male (Holotype). B. *N. junctalis* (HAMPSON), male. C. *N. albibasalis* sp. nov., male (Holotype). D. *N. minuta* sp. nov., male (Holotype).



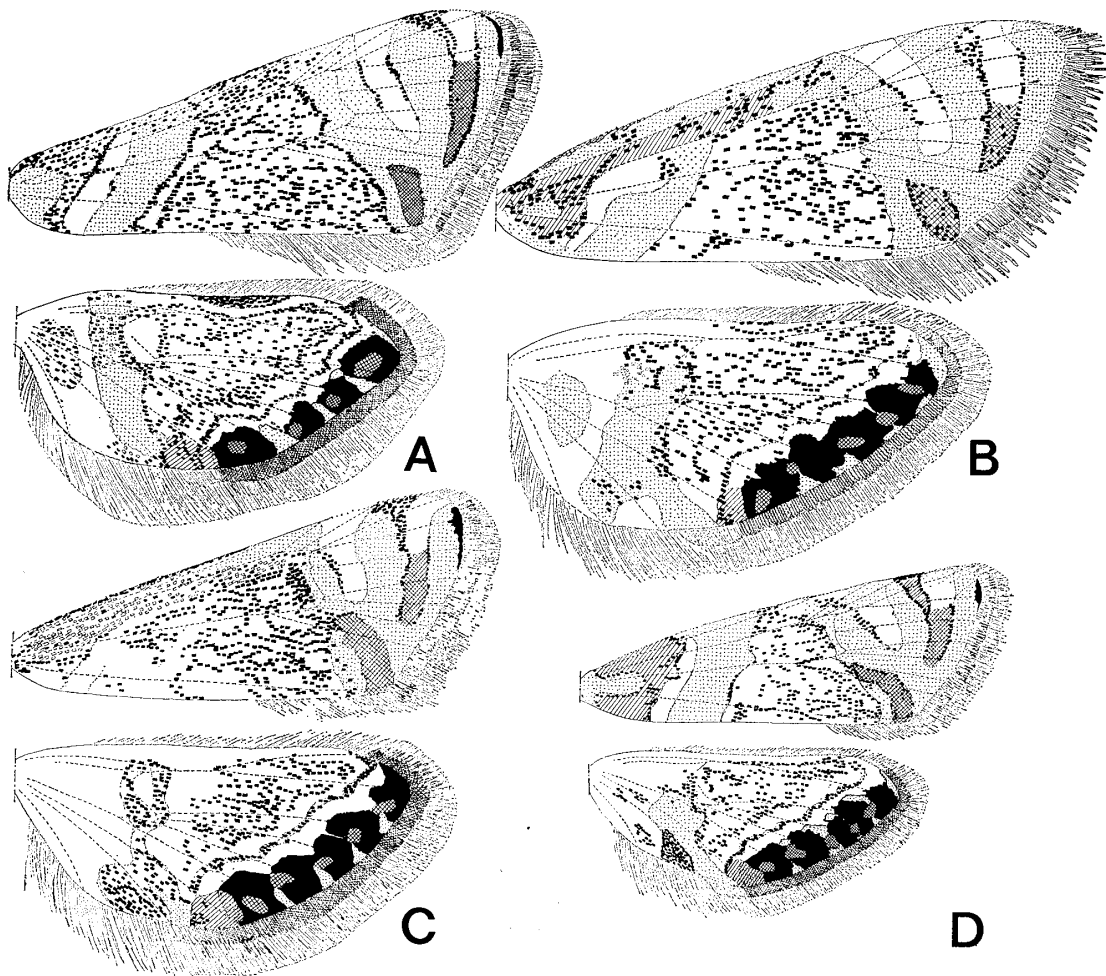


Fig. 15. Wing marking. A. *N. saigusai* sp. nov. B. *N. junctalis* (HAMPSON). C. *N. albibasalis* sp. nov. D. *N. minuta* sp. nov.

length of phallus; vesica without cornutus. Juxta rather wide, with proximal margin broadly rounded and apical margin acutely emarginate.

Hair pencil almost twice as long as 7th tergum and fuscous. Lateral hair tuft on 8th sternum as in *albibasalis*.

*Female genitalia*: Closely resembling those in *albibasalis*, but differing in next points. Ductus bursae shorter. Bursa copulatorix a little longer and its apical portion bearing slenderer signa. Ductus seminalis narrower.

*Size of forewing*: Male, 4.9–5.3 mm; female 5.5–5.6 mm.

*Immature stages*: Unknown.

*Holotype*: Male, 21. viii. 1973, Taken, Amami-Ôshima, Amami Is., Y. YOSHIYASU.

*Paratypes*: 1 ♂, 13. vii. 1930, Beppu, Ôita Pref., T. TORIKATA (KU); 1 ♀, 9. ix. 1933, Mt. Sobosan, Ôita Pref., K. YASUMATSU (KU); 2 ♂, 15. viii. 1968, Ôtomi, Iriomotejima I., the Ryûkyûs, S. AZUMA (IC); 1 ♂, 21. viii. 1971, Kanbiri, Iriomotejima I., the Ryûkyûs, S. AZUMA; 1 ♂, 15. vii. 1972, Onoaida, Yakushima I., Y. YOSHIYASU; 2 ♂, Nakanoshima I., Tokara Is., 23. vi. 1973, H. MAKIHARA; 1 ♀, 6. ix. 1975, Mt. Bannadake, Ishigaki I., the Ryûkyûs, Y. YOSHIYASU; 1 ♂, 6. viii. 1976, Tanegashima I., T. SHIBA.

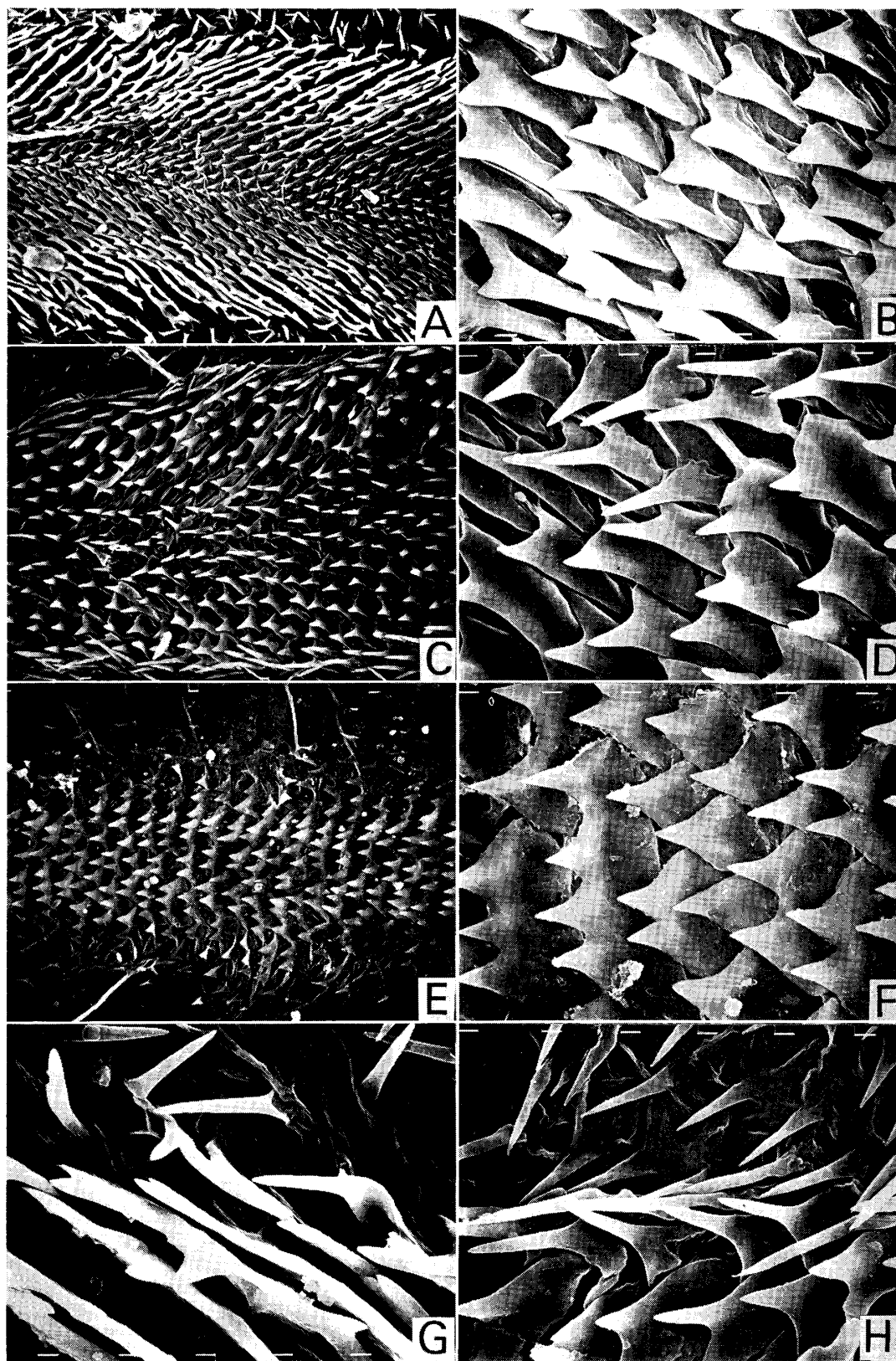


Fig. 16. Female signa. A. *N. saigusai* sp. nov. ( $\times 300$ ). B. Ditto, proximal portion ( $\times 1500$ ). C. *N. junctalis* (HAMPSON) ( $\times 300$ ). D. Ditto, proximal portion ( $\times 1500$ ). E. *N. albibasalis* sp. nov. ( $\times 300$ ). F. Ditto, proximal portion ( $\times 1500$ ). G. *N. saigusai* sp. nov., medial to distal portion ( $\times 1500$ ). H. *N. junctalis* (HAMPSON), medial to distal portion ( $\times 1500$ ).

*Distribution:* Japan (the Ryûkyûs, Amami Is., Tokara Is., Yakushima I., Tanegashima I., Kyûshû).

### Type Depository

All the types are deposited in the Laboratory of Entomology, Faculty of Agriculture, Kyôto Prefectural University, except for some paratypes preserved in the Entomological Laboratory, Kyushu University (KU) and in Dr. INOUE's collection (IC).

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### References

- ALLYSON, S., 1977. A study of some north American larvae of the genus *Tetralopha* ZELLER (Lep.: Pyralidae: Epipashinae). *Can. Ent.*, **109**: 329–336.
- HAMPSON, G. F., 1891. Illustrations of Typical Specimens of Lepidoptera Heterocera of the Collections of the British Museum. **8**. iv+144 pp., 18 pls. London.
- 1893. *Ibid.*, **9**. v+182 pp., 20 pls. London.
- 1896. The Fauna of British India, Moths. **4**. xxviii+594 pp. London.
- HASENFUSS, I., 1960. Die Larvensystematik der Zünsler. Abhandlungen zur Larvensystematik der Insekten., **5**. 263 pp. Berlin.
- HINTON, H. E., 1946. On the homology and nomenclature of the setae of lepidopterous larvae, with some notes on the phylogeny of the Lepidoptera. *Trans. R. ent. Soc. Lond.*, **97**: 1–37.
- INOUE, H., 1955. Nymphulinae. *The check list of lepidoptera of Japan*, **2**: 154–157.
- KLIMA, A., 1937. Pyralidae: Subfam. Scopariinae, Nymphulinae. *Lepidopterorum Catalogus*, (84): 1–226. W. Junk.
- LANGE, W. H. Jr., 1956. A generic revision of the aquatic moths of North America: (Lepidoptera; Pyralidae, Nymphulinae). *Wasmann J. Biol.*, **14**: 59–144.
- MARUMO, N., 1923. List of Lepidoptera of the islands Tanegashima and Yakushima. *J. Coll. Agr. Tokyo Imp. Univ.*, **8**: 187.
- MOSHER, E., 1916. A classification of the Lepidoptera based on characters of the pupa. *Bull. Illinois St. Lab. nat. Hist.*, **12**: 17–159.
- MUNROE, E., 1972. Pyraloidea: Pyralidae (Part). The Moths of America North of Mexico. **13**. 1A. 134 pp. Classey, London.
- 1973. *Ibid.*, **13**. 1C. 253–304, 13 pls. Classey, London.

- MUTUURA, A., 1971. In ESAKI *et al.*, Icones Heterocerorum Japonicorum in Coloribus Naturalibus. (rev. ed.) (1). xix+318 pp., 64 pls., Hoikusha, Osaka.
- NAKAMURA, M., 1977. Notes on the immature stage of *Musotima acclaralis* WALKER (Lap.: Pyralidae). *Kita-kyushu no Konchu*, 23: 33-36, 1 pl. (In Japanese.)
- SNELLEN, P. C. T., 1880a. Midden-Sumatra. *Natuurlijke Historie*, 4(8): 1-92, 5 pls.
- 1880b. Nieuwe Pyraliden op het Eiland Celebes gevonden door Mr. M. C. Piepers. *Tijds. Ent.*, 23: 198-250.
- YOSHIYASU, Y., 1979. A new species of Nymphulinae from Japan, with description of the immature stages (Lepidoptera: Pyralidae). *Akitu*, (n. s.), (22): 1-14.

## 摘 要

1. 日本産アトモンミズメイガ属 (*Nymphicula*) 4種を記載し、本属の分類学的位置について考察した。
2. 4種のうち、*N. saigusai* (アトモンミズメイガ)、*N. albibasalis* (モトシロアトモンミズメイガ [新称])、*N. minuta* (コアトモンミズメイガ [新称]) は新種であり、また *N. junctalis* (HAMPSON) (アマミアトモンミズメイガ [新称]) は日本初記録である。
3. *N. saigusai* YOSHIYASU は、現在まで *N. blandialis* (WALKER) として知られていた種である。また丸毛 (1923) により、種子島の標本に基づいて *Cataclysta junctalis* HAMPSON として日本から記録されていた種は、四国・九州から琉球列島にかけて分布する *Nymphicula minuta* YOSHIYASU であることが判った。
4. *N. saigusai* YOSHIYASU と *N. junctalis* (HAMPSON) の幼虫は陸生で、山の切り通しの山側の斜面に生息しており、ツボミゴケ *Jungermannia truncata* NEES や蘚類を食草とする。幼虫は土で長さ約 1 cm (老熟幼虫) の円筒形の巣 (ケース) を作る。生息地を含め両種の幼生期はよく似ているが、幼虫の刺毛や蛹の刺毛数、それに巣の形状などによって明瞭に区別できる。